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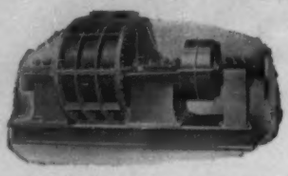

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THE IRON TRADE REVIEW

Vol. LVIII Cleveland, April 20, 1916 No. 16

Buys Round Tonnage of Bessemer

Youngstown Sheet & Tube Co. Comes Into the Market—Continued Actvity in Finished Materials

THE purchase of 60,000 tons of bessemer pig iron by the Youngstown Sheet & Tube Co. is the only large transaction concerning which definite information is obtainable, but some other purchases have been made by steel companies and inquiries for very large tonnages of steel-making irons are pending. Although foundry iron is not so active as are the steel-making grades, a very fair business is being done. The inquiry of a very important radiator company is pending and will probably be placed in a few days. One company, which has entered the market for a tonnage of steel-making iron in the east, was entirely unexpected. Some weakness continues in southern irons, which are obtainable at $15 for first half and $15.50 for last half for No. 2 Birmingham.

While high prices of some finished products, especially structural material, have checked a few projects, the general demand continues as strong as ever and the outlook for the future is very encouraging.

Price Advances

Price advances include $8 a ton on boiler tubes and $2 a ton on oil country pipe, announced by the leading producer. An independent company has notified the trade of a $2 advance in the price of black and a $4 advance in the price of galvanized merchant pipe, and it is probable that there will be a general advance of standard merchant pipe this week. Advances in wire are expected at an early date, and it is probable that prices of bolts and nuts will be marked up this week.

Plates

Positive evidence of the remarkable strength of the plate market is furnished by the fact that the Pennsylvania railroad was recently compelled to pay 3.65c and 3.75c, Pittsburgh, for delivery in the third quarter of the year, for about 10,000 tons. For delivery in June and July, 4c, Pittsburgh, is being paid, and one leading eastern plate manufacturer is quoting 4c for January delivery. Cleveland makers have advanced to a minimum of 3.50c and are contracting to Jan. 1.

Iron Ore

It is expected that the loading of iron ore at upper lake ports will be started within a few days, but much difficulty has been experienced in fighting ice, which is unusually heavy for this time of the year on all the lakes. The very great producing capacity of the Lake Superior district is shown by the difficulty which is being experienced in selling high phosphorus ores. In some cases, these ores have been sold at concessions of 15 to 20 cents per ton.

Machinery

Railroad buying of machine tools and general equipment has shown marked improvement during the past week. There is also increased activity in foreign demand, which is much more active than for several weeks. The New York Central has started to distribute a large list of machine tools. The Baltimore & Ohio has placed additional orders and other railroads are buying freely.

Bars

Some difference of opinion has prevailed among manufacturers of steel and munitions as to further contracts being placed in this country for finished shells for European nations, owing to the fact that England and France have greatly increased their producing capacity, but during the past few days new inquiries, calling for 250,000 tons of shell steel, mostly for France, have appeared in the eastern market. An American steel foundry company is reported to have closed for from 20,000 to 30,000 tons of steel forgings for large shells.

Coke

The continued weakness in coke is attributed to the growing competition of by-product fuel and to the fact that blast furnace consumption does not promise to be as large in the near future, as it is doubtful whether the very large percentage of active blast furnace capacity can be kept in operation. About 92 per cent of the blast furnace capacity of the country is now active. Scrap is weak at Pittsburgh and quiet in nearly all centers.

THE OPEN HEARTH

Progressive Publicity

THE two most interesting examples of progressive publicity that have ever come to our attention have just been furnished by the Youngstown Sheet & Tube Co. and the Bethlehem Steel Co. The Youngstown company, whose wonderful success has aroused the admiration of everyone familiar with its history, makes a radical departure in advertising in this week's issue of *The Iron Trade Review* in devoting two full pages, not to its own products, but to a most impressive argument in favor of removing the tariff from the domain of politics by creating a non-partisan commission, empowered to make such tariff rates as may be necessary from time to time, pending approval by congress, in order to provide revenue, protect labor and stabilize business. We trust every reader of *The Iron Trade Review* will turn to pages 8 and 9 of the advertising section and read this argument.

The other example of publicity to which we refer consists of a series of documents which have been issued by the Bethlehem Steel Co. and published daily in *The Daily Iron Trade* for their news value. These documents are written in a most attractive manner and give unanswerable arguments in opposition to the building of an armor plate plant by the government. After issuing eight numbers of the series, there appeared the most interesting, and perhaps the most important of all, No. 9, which is headed, "A Mistake in the Policy of the Bethlehem Steel Co." This document tells of false charges that have been made against the Bethlehem Steel Co., and says the mistake of the Bethlehem Steel Co. has been that it kept quiet. Then the company adds:

We shall make the mistake of silence no longer.

Henceforth we shall pursue a policy of publicity. Misinformation will not be permitted to go uncorrected.

It is and has been the policy of our company to deal with the American government in the frankest and most liberal manner. We expect henceforth to place the details of all those relations before the American people.

We have offered to make armor for the government at any price the government shall name as fair.

Certainly the widespread publication of such an offer is an effective challenge to our own good faith.

The above declaration is the wisest thing the company has done. The decision may have come too late to defeat the Tillman bill, but it is bound to have results sooner or later in arousing the American people to see the iniquity of the present policy of the government going into the manufacture of armor plate, nitrate and other things at the expense of the people.

The general adoption by business men of the policy now being pursued by the Bethlehem and Youngstown companies would bring about a revolution in the relations of government and business and promote the welfare of the companies, their employes and the public to an incalculable extent.

Personal Enterprise Indispensable

NEVER was the necessity for hearty co-operation between the government and the business interests of this country more strongly emphasized than at the discussions of the vital question of industrial preparedness at the spring meeting of the American Society of Mechanical Engineers at New Orleans last week. It was clearly brought out that in the event of a war, it would be almost more essential that the nation's industries be prepared than that the purely military forces be ready, for without effective co-operation behind the line, the army and navy can do nothing. The European war has demonstrated that a first class conflict taxes every business institution in the country to its outermost fiber, and in this great work the iron, steel and machinery industries bear the brunt of the burden.

From the interest manifest at the New Orleans meeting, it was evident that the subject of industrial preparedness is of far reaching imporance to the business leaders of this country and to the mass of the people as well. We are fortunate, therefore, to be able to present elsewhere in this issue, a liberal resume of the vital facts brought out at the New Orleans meeting, including discussions by several of the country's most eminent engineers and executives. The opinions of these men bring clearly into the foreground the absolute necessity for thorough and effective organization. Dynamics count in war.

Effective organization for industrial preparedness requires the services of the most highly trained and capable manufacturing and commercial leaders in the country. Men of this character have responded in force in the preliminary work now being pushed by the great engineering societies and it is refreshing to note the hearty co-operation they are receiving from high executive circles in Washington.

It is disquieting, however, in view of the tremendous issues at stake, to witness the destructive efforts of certain cliques in congress, who are seizing on preparedness as a means for the advancement of pernicious schemes for the government ownership and operation of steamships, armor plate plants, nitrate works and what not. Such projects can serve only to throttle and impede the progress of American industry and personal enterprise, on which the nation must of necessity fall back in case of a supreme crisis.

Common Good

Is Sought by Engineers in a Get-Together Movement in Chicago

The conference on engineering co-operation held in the rooms of the Western Society of Engineers in Chicago last week was attended by representatives of 42 national, state and local engineering and technical societies from all parts of the United States. The purpose of the conference was to bring about a closer relation among engineers and engineering organizations, to discuss ways to improve standards of engineering practice and to gain a clearer recognition of the engineer as a civic asset. F. H. Newell, professor of civil engineering of the University of Illinois, is chairman and C. E. Drayer, secretary of the Cleveland Engineering Society, is secretary of the committee on engineering co-operation which had the meeting in charge.

The program, occupying two days, April 13 and 14, consisted of the presentation of papers and addresses by delegates from the various societies represented. Subjects discussed were practicability and limits of co-operation, employment, ethics and legislation. Co-operation from the standpoint of the state society was presented by Paul Hansen, president of the Illinois Society of Engineers, and by Clyde T. Morris, president of the Ohio Engineering Society; from the standpoint of the national societies, by P. Junkersfeld, of the American Institute of Electrical Engineers; Horace C. Gardner, of the American Society of Mechanical Engineers; De Witt V. Moore, of the American Society of Engineering Contractors; J. F. Hale, of the American Society of Heating and Ventilating Engineers; C. H. McDowell, of Americain Institute of Mining Engineers; and John Howe Peyton, of the Engineering Association of the South; from the standpoint of the local society, by Ferd. G. Gasche, of the Engineers' Society of Western Pennsylvania; A. J. Himes of the Cleveland Engineering Society; H. L. Keck, of the Dayton Engineers' Club, and Lewis R. Ferguson, of the Engineers' Club of Philadelphia. Short addresses were made by Isham Randolph, Onward Bates, John W. Alvord and E. T. Perkins.

Legislation, with particular reference to recent experiences in Illinois, was discussed in a paper by H. J. Burt, of the Structural Engineers' Society of Illinois. Delegates to the conference were entertained by the Chicago Engineers' Club and at a complimentary luncheon at the Hotel Kaiserhoff, by subdivision 63, engineers, of the Chicago Association of Commerce.

Employment was the subject of a paper by Arthur Kneisel, secretary of the American Association of Engineers. A. W. Hoffmann, of the Associated Technical Men, gave a paper, heard with marked interest, descriptive of engineering societies and their activities in Germany.

Other speakers told about the activities of the different engineering societies throughout the United States. This information contributed materially to an understanding of the problems before the conference.

By unanimous resolution there was established a sub-committee with F. H. Newell as chairman and four other members to be selected by him with instructions to prepare a plan for forwarding co-operation among engineering societies upon matters of general interest to the engineering profession, such plan to be presented for formal consideration at a third conference on engineering co-operation to be called by the sub-committee at such time and place as may seem to it desirable.

Spirit of the Conference

By Isham Randolph

"Let us have a central organization—call it what you will—with no authority to command, but which has ears to hear and the voice to be heard, and let those ears be open to every plea or promise of common good, and let that voice go out to all affiliated bodies carrying this plea or this promise for the common good, and let us come together at least once a year and feel that 'touch of nature which makes the whole world kin,' and growing out of that kinship let us consider and do those helpful things which will bless our comrades and overflow with helpfulness to our country and our kind."

Will Build Tube Mill

The Detroit Seamless Steel Tubes Co. has recently purchased a tract of land on West Fort street, Detroit, upon which, within the near future, it will erect a large, modern tube mill.

The constantly increasing use of seamless steel tubes by the automobile manufacturers together with the growing demand for locomotive, traction engines, etc., has made it necessary for this company to increase its capacity by the addition of this new mill.

Formalities

Connected with Merger of Two Companies with Bethlehem

Dissolution of the Pennsylvania Steel Co., of New Jersey, and of the Pennsylvania Steel Co., of Pennsylvania, and the Maryland Steel Co., which it controls, will be voted upon at the special meeting of the stockholders, which has been called for Camden, N. J., Thursday, May 4. At that time, the stockholders will act formally upon the acceptance of the proposition recently made by the Bethlehem Steel Co., which allows the payment of par for the preferred and $27.08 per share for the common stock, payable in Bethlehem Steel Co. bonds. Holders of approximately two-thirds of the preferred and of approximately 98 per cent of the common stock have formally signified their willingness that the company be liquidated on this basis. For the remaining 2 per cent of common stock outstanding, the Bethlehem company, as recently noted, has made an offer of $75 per share.

The dissolution of the Pennsylvania Steel Co. and the merging of its identity in the properties of the Bethlehem Steel Corporation, will represent the passing of one of the old-line and best-known steel enterprises of the country, in the operations of which were included various historical events in the development of the iron and steel industry of this country. The original Pennsylvania Steel Co., of Pennsylvania, was organized March 23, 1866, with perpetual charter. It was succeeded on Aug. 1, 1895, by the Pennsylvania Steel Co., of Pennsylvania, which was acquired practically in total, by the Pennsylvania Steel Co., of New Jersey, April 28, 1901.

Opens Sales Office

A sales office for "The Standard" scales, concrete mixers, etc., has been opened at Detroit, 82 Woodbridge street west, by the Michigan Scale & Supply Co., which will be direct representative of the Standard Scale & Supply Co., in the sale of scales, concrete mixers, hoists and contractors' equipment.

The large volume of business at Detroit and the surrounding territory has made it necessary to have a local connection at that point, to give manufacturers, railroad companies, contractors, etc., the benefit of quick deliveries and special services similar to that maintained at other houses and agencies of that company.

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products April 19, average for March, 1916, average for January, 1916, and average for April, 1915. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Apr. 19, 1916.	Aver. for Mar., 1916.	Average for Jan., 1916.	Aver. for April, 1915.
Bessemer pig iron, Pittsburgh	$22.45	$21.55	$21.32	$14.55
Basic pig iron, Pittsburgh	19.20	19.20	19.20	13.45
No. 2 Fdy. pig iron, Pittsburgh	19.70	19.45	19.95	13.45
Northern No. 2 Fdy., Chgo	19.00	18.70	18.50	13.00
Lake Superior Charcoal, Chgo.	19.75	19.75	19.25	15.75
Mall. Bess., Chgo	19.50	19.20	19.00	13.00
Southern No. 2, Birmingham	15.00	15.00	14.50	9.35
Southern Ohio No. 2, Ironton	18.50	18.50	18.00	12.75
Basic, eastern Pa	20.50	20.00	19.50	13.25
No. 2X Virginia furnace	18.50	18.00	17.50	12.50
No. 2X foundry, Philadelphia	20.50	20.00	19.75	14.25
Ferro mang., Balti., (forward)	175.00	175.00	110.00	100.00
Bessemer billets, Pbgh	45.00	40.60	33.75	19.50
Bess. sheet bars, Pbgh	45.00	41.00	33.75	19.60
Op.-h'th sh. bars, Pbgh	45.00	41.00	34.75	19.50
Open-hearth billets, Pbgh	45.00	40.60	34.75	19.60
Steel bars, Chgo	3.10	2.50	2.03	1.38
Steel bars, Pittsburgh, contr.	2.50	2.34	1.865	1.20
Iron bars, Philadelphia	2.559	2.559	2.259	1.20
Iron bars, Cleveland, local del'y.	2.40	2.40	2.00	1.20
Iron bars, Chgo. mill	$2.35	$2.19	$1.83	$1.15
Beams, Chgo.	3.10	2.50	2.03	1.38
Beams, Pittsburgh, contr.	2.50	2.40	1.865	1.15
Beams, Philadelphia	2.659	2.659	2.159	1.35
Tank plates, Pbgh., contract	2.75	2.34	1.875	1.11
Tank plates, Chicago	3.50	3.15	2.05	1.38
Tank plates, Philadelphia	3.809	3.409	2.409	1.35
Sheets, blk., No. 28, Pbgh	2.90	2.75	2.58	1.80
Sheets, blue an., No. 10, Pbgh.	3.00	2.87	2.45	1.30
Sh., galv., No. 28, Pbgh	5.00	4.82	4.75	3.30
Wire nails, Pittsburgh	2.40	2.38	2.125	1.59
Connellsville fur. coke, contr.	2.90	2.80	2.38	1.65
Connellsville fdy. coke, contr.	3.50	3.60	3.75	2.25
Heavy melting steel, Pbgh	18.00	17.95	17.50	11.90
Heavy melting steel, east'n Pa.	18.00	17.50	17.00	11.25
Heavy melting steel, Chgo.	16.75	16.20	15.50	9.30
No. 1 wrought eastern Pa.	23.00	22.50	22.25	12.50
No. 1 wrought, Chgo.	17.00	16.15	15.50	8.55
Rerolling rails, Chgo.	18.00	17.20	17.70	9.85
Car wheels, Chgo.	14.25	14.05	14.75	9.80

(For Additional Prices See Page 906)

Steel Companies Anxious to Buy

Negotiations for Large Tonnages of Bessemer and Basic Pig Iron—

Decided Increase in Activity in Important Centers

Pittsburgh, April 18.—Almost every manufacturer of steel products in the Greater Pittsburgh district has been sounding the market for pig iron the last 10 days, and an active buying movement appears to be under way. It is known that some of the larger steel companies in western Pennsylvania and eastern Ohio would close negotiations for round tonnages of bessemer and basic iron, if they were available. A prominent manufacturer in the immediate district quietly has been negotiating for basic iron and a Youngstown firm has taken 60,000 tons of bessemer iron for shipment the remainder of the year. Another Youngstown interest, actively negotiating for basic iron, has closed for a small tonnage, probably with a pig iron interest in the Mahoning valley. To prevent unnecessary excitement, purchasing agents of several steel companies interested in the pig iron market have been carrying on negotiations through middlemen.

Bessemer pig iron is being held at $21.50 by dealers in this district. The last important sale of basic iron was on the basis of $18.25, valley, but it is not believed that much iron is available at that figure.

Big Youngstown Purchase

Youngstown, April 18.—The Youngstown Sheet & Tube Co. has quietly purchased 60,000 tons of bessemer iron during the past few days. This purchase supplements one of 25,000 tons during the third week of February, making a total of 85,000 tons of standard bessemer that the Sheet & Tube company has purchased since the opening of the year. The aggregate of 60,000 tons bought at this time, comprises the total of several purchases made from different interests in the Pittsburgh and valley districts. One lot of about 8,000 tons that has been held by one interest in the valley for some time, figured in the purchase. The remainder, taken from scattered sellers, is believed to represent the bulk of the bessemer iron tonnage that had been held for sale in these districts. The iron was taken at prices close to the present quotations of $21.00 to $21.50. Owing to the scattered nature of the purchases, it is not believed that the entire tonnage was taken at the same figure. Delivery on this iron is to extend over the balance of the year. The purchase was a surprise to some, as the purchase of the Andrews & Hitchcock furnaces last week by the Sheet & Tube company was thought to mark the definite withdrawal of this company as a buyer of pig iron. It is understood, however, that this latest purchase was made to permit the Andrews & Hitchcock furnaces to fill orders previously booked. One of these furnaces is sold up to July 1 and the other for several months additional. One stack will be run on iron for the steel company, while the other will continue to make merchant grades for some time. A pig casting machine will be installed shortly. When both furnaces operate on steelmaking iron, the Sheet and Tube company will be self contained on its pig iron requirements.

Chicago Demand Continues

Chicago, April 18.—Demand continues excellent and prices steady. Conditions surrounding the market for malleable iron are such that an advance from the present quotation of $19.50, Chicago furnace, seems likely to be made within the next few days. No change in the situation as to foundry iron is noted. The prevailing quotation of $19, Chicago furnace, is current for all business being booked.

Although inquiry is less than was the case during March, when sales broke all records, some lots of 1,000 tons are being considered, but most of the business is for smaller tonnages.

A division of opinion seems to exist as to the advisability of contracting now for next year's requirements of iron, especially of malleable. Some

(*For complete prices see page* 906.)

melters believe prices will be lower at the time they need iron for 1917 use, while others read the signs of the times to indicate that prices will be higher than at present. The result is that comparatively little inquiry for 1917 iron is being entertained, and makers are well satisfied to let the market rest until conditions develop themselves more clearly.

Undoubted weakness in southern iron continues to be evident. No doubt exists that this grade can be bought at $15, Birmingham, for first half delivery and at $15.50, Birmingham, for last half. Some makers are holding their quotations $0.50 per ton higher than these figures and quotations on first half of 1917 are $0.25 to $0.50 beyond these. Present weakness seems to be the result of an undigested supply of warrant iron. The effect on the entire market is distinctly bad.

An advance of $2 per ton on Jackson county silveries and bessemer ferro-silicon, bringing 8 per cent silveries to $29, furnace, and 10 per cent ferro-silicon to $33, furnace. The usual differential for equal percentages is $2 per ton, but at present it is $3.

Some trade in low phosphorus is being done with prices varying somewhat. A sale recently was made of 1,000 tons at $34, delivered, to a melter on Lake Michigan. This is a lower price than has been made on most transactions, most makers obtaining $35 to $35.50, delivered Chicago or Milwaukee, and in some instances high silicon has brought better prices than these.

No change has taken place in Lake Superior charcoal iron, former quotations applying.

Very Fair Activity

Cleveland, April 18.—Sales of pig iron in the Cleveland district and from furnaces controlled by Cleveland agencies are very satisfactory, although not of as large volume as those of last month. One firm has sold 20,000 tons of various grades during the past week, but none of it for delivery in the city of Cleveland. Another firm, during the past two weeks, has sold about 7,000 tons of foundry iron at $19.50, delivered, in the city and $19, furnace, for delivery outside the city. Still another firm is understood to be still shading this quotation 50 cents.

Inquiry for 100,000 Tons

Buffalo, April 18.—The week opened with the furnaces of the Buffalo district figuring on an inquiry from various consumers totaling about 50,000 tons, but in the past 24 hours, from sources not generally supplied from the Buffalo stacks, the inquiry has mounted to fully 100,000 tons. The producing interests say that various deliveries are mentioned in the negotiations.

The sales for the week amount to about 21,000 to 24,000 tons of foundry and other grades. The sales made and the heavy tonnages being figured, it is stated, have a tendency to cause a firming up in pig iron prices. The schedules at the present time are holding firmly to the figures previously quoted, with the exception of basic, which has gone to $19.50 to $20.00. Some fair tonnage lots have been booked in the past few days at $19.75. The furnaces of the Buffalo district are sold up practically solid over the remainder of the year.

Buying Decreases

Philadelphia, April 17.—A reduced rate of buying of pig iron is shown in this territory, which is not surprising in view of the statement by some leading sellers representing various furnaces that their bookings of foundry metal in March were the heaviest in their history. The declaration of makers that they are sold up so well that they are indifferent towards new business except at their own price, is being heard more frequently. This condition is reflected in more uniform prices and $20.25 to $20.75, Philadelphia, for No. 2X embraces the competitive market. The Baldwin Locomotive Works has closed for about 4,500 tons of No. 1X and 3 for third quarter, a considerable part of which, especially the lower silicon, went to Alabama makers. The price for this grade is reported to have been around $18.75, delivered. The Pennsylvania railroad is out for 600 tons of high manganese iron and 700 tons of charcoal, third quarter. The week's sales of charcoal iron in this territory were considerable, totaling 3,500 to 4,000 tons. Virginia iron is quiet and unchanged. Eastern makers of standard low phosphorus again have advanced their price and now quote $34 to $35, Philadelphia basis, at which they have no trouble to secure orders, as the demand is strong. The week's sales of standard iron were 3,000 to 4,000 tons, largely for next year, as leading makers are filled up for this year and have entered a fair tonnage to date, for shipment after Jan. 1. Consumers around Chester, Pa., have bought freely. Lebanon low phosphorus is strong, but unchanged. An eastern steelmaker continues to offer basic for nearby delivery at $20, furnace, or $20.50 to $20.75, delivered. There are other sellers at $20.50, delivered. A new Crum Lynne, Pa., consumer recently bought a small trial lot and is inquiring for 1,000 to 1,500 tons. One of the largest eastern Pennsylvania consumers of basic is holding back deliveries because he has accumulated a heavy stock.

(*For complete prices see page* 906.)

Heavy Inquiry Pending

New York, April 18.—Negotiations for heavy tonnages quietly initiated by some of the largest buyers in the country, are stirring the inside circles of the iron market and attention by producers is centered upon the development of these propositions, which involve both foundry and steelmaking grades. It is of much significance that the negotiations include certain eastern producers who, under normal conditions, are not buyers of iron, indicating that their current requirements are in excess of their ability to supply. The tone of the market has been considerably strengthened by the large inquiries now up for quotations. Some of the consumers in this territory continue to come out for iron for the first quarter and first half of 1917. While sellers, generally, are not soliciting such orders, they are accepting business from preferred customers at little or no advance over last half prices. Eastern Pennsylvania iron for first half of next year has been done at $20.50, furnace, for No. 2X and Buffalo iron at $19, furnace. Sales of the week include 5,000 tons of low-grade iron for second quarter to the American Locomotive Co. for Dunkirk, which went to Buffalo makers; 2,500 tons for Nos. 1X and 3 for last half for a Paterson, N. J., buyer divided among Pennsylvania and Buffalo makers; 3,000 to 4,000 tons of foundry for shipment into next year to another buyer in this district; 1,000 tons to a Connecticut consumer for first half of next year. Current tidewater prices for No. 2X are from $20.50 to $21. Some eastern makers are following closely the recent inquiry in behalf of the French government, put out by J. P. Morgan & Co. for the largest tonnage of bessemer and special bessemer any producer could offer. The New Haven railroad raised its embargo on pig iron at midnight, April 14, and shipments now can be made by that route to practically all New England points.

Pig Iron Quiet

Cincinnati, April 18.—The pig iron market is passing through one of its frequent dull periods. This is the second time that a lapse in buying has occurred since the first of the year. General inquiry is very light and dealers are figuring principally upon business secured through private solicitation. Prices are unchanged because the excessive strength in pig iron and finished materials in sur-

rounding districts more than counterbalances the lack of transactions in this territory. Southern Ohio furnaces are well sold up on basic iron, which will be shipped to nearby rolling mills, but demand for either southern or southern Ohio foundry iron has been low for more than a month. Southern No. 2 foundry is quoted at $15, Birmingham basis, for the first half, and at $15.50 for the second half. This latter price has also been made to extend into the first half of next year, but the usual price for that delivery is $16. Southern Ohio No. 2 foundry iron is quoted at $19, Ironton basis, for 1916 and the first quarter of 1917. Silvery iron is holding at $27, furnace, for 8 per cent silicon.

Quiet in the South

Birmingham, Ala., April 18.—The April pig iron market has been quiet. One maker had sold 20,000 tons up to the fifteenth, the equivalent of that period's make, but report in general is of small business. For southern delivery the same party took 200 tons for second quarter and 500 for third quarter at $15.50 for each period. Special analysis tonnage has sold from $16 to $17, one high silicon lot for California delivery bringing $17.50. No large consumers have been in the market for some time, the leading pipe, radiator and harvester interests being well supplied. There is some iron to be had at $15, spot f. o. b. Birmingham, and other southern iron-making territories are believed to be underselling this Birmingham basis fractionally. It is agreed that $15.50 is the second half price, efforts to get $16 having been withdrawn. The Alabama make is now at the rate of 2,750,000 tons per annum as compared with a prior high record of a trifle over 2,000,000 tons, and will be increased during the second half by the blowing in of the new Sloss-Sheffield stack at Sheffield and that of the Alabama company at Gadsden. It also looks now as if efforts to resume at the Woodstock furnaces in Anniston will materialize. Warrants and free foundry on Alabama yards are around 100,000 tons each. These conditions are being weighed by manufacturers and consumers alike. The large holdings of the big consuming interests also figure in the game. The leading interest names $15 and $15.50 for first and second halves. An effort to secure an order for 2,000 tons at $15.75 by a manufacturer making an especially desirable iron resulted in its loss. The loss of regular customers following an effort to get over $15.50 for second half has been a leading element in bringing all makers to that level. An inquiry for a round lot of charcoal iron for 1917 delivery has been received. Charcoal metal with two active stacks is bringing $22.50 to $23.

Pig Iron Warrants

New York, April 18.—After a period of fair activity late in March, the market for pig iron warrants has become quiet. Prevailing quotations on warrants are from $14.25 to $14.75 at storage yard in the Birmingham districts for standard Alabama No. 2 foundry iron.

Silvery Advances

Cincinnati, April 19. (By wire.)—Southern Ohio silvery has advanced to $29 for 8 per cent silicon except one furnace, which holds at $27, but is expected to advance also before the end of the week.

May Build Third Stack

Consideration of a plan to erect a third blast furnace stack at the Detroit Iron & Steel Co.'s site is being given by the company. At a recent meeting of the directors of the company held in Cleveland, the plan was discussed and was given favorable consideration. However, it was decided to put the matter before the stockholders of the Detroit company at their next annual meeting which will be held in June. The Detroit Iron & Steel Co. which is affiliated with M. A. Hanna & Co., now has two stacks at Detroit which cater to the general pig iron trade.

Mansfield Company Expanding

Mansfield Sheet & Tin Plate Co. has completed an extension to its plant, 140 x 300 feet. It is installing six cold and one hot mill and a 350-horsepower motor and gear driver. With the completion of these improvements, probably about June 1, the company will have a total of seven hot and seven cold mills. The company also has effected other economies in operation, such as arranging so that the loading and unloading all can be done under the same roof as the rest of the plant. President W. H. Davey says the company will have a new plant equipped for making special sheets entirely.

Frank E. Thompson, for 23 years an assistant editor of the *Iron Age*, died at his home in Bayonne, N. J., April 15, aged 63 years.

(*For complete prices see page* 906.)

Metal Markets

Active Demand for Copper—Fair Business in Spelter

New York, April 18.—Copper continued to furnish most of the interest in the metal markets during the week. Although there have been no bookings to compare in size with the huge tonnages placed by the British government, reported in last week's issue, demand has continued active from domestic as well as other foreign consumers. Prices continue to reflect a strong advancing tendency, and the metal constantly is getting harder to obtain for shipment prior to July. Electrolytic for prompt and April shipment is quoted at 29 to 30c, delivered 30 days; July shipment is quoted at 28.50c, delivered 30 days, and shipment during the remainder of the year at 28 to 28.50c. The best brands of lake copper are quoted at 29 to 29.50c, cash, and are difficult to obtain for shipment prior to August. Ordinary lake copper for prompt and April delivery is quoted at 29 to 30c, cash, while ordinary and arsenical brands for June and July shipment are quoted nominally at 28.50 to 28.75c, cash. Ordinary casting copper is quoted at 27.50 to 27.75c, cash.

The spelter market has been characterized by the transaction of a fair-sized business right through the week and, up to yesterday, by advancing prices. The distribution of the government's report, showing the huge increase, which have been effected in production of the metal in this country yesterday exerted a slightly reactionary influence, so that, despite, the sold-up condition of the market, prompt metal sold off somewhat. Today a further slight decline was noted, particularly on futures. Prime western is quoted: Prompt 18.87½ to 19c, St. Louis; April 18.75 to 19c; May 18.37½ to 18.50c; June, 17.62½c to 17.87½c; third quarter, 16.50c; last half, 15c. to 15.50c. Brass special spelter for prompt shipment is quoted at 21.75c to 22c, St. Louis. It is reported but not verified that the French government has closed for a large block of spelter for future shipment.

The lead market continues strong but quiet, with only occasional bookings. The outside market is quoted at 7.50c, St. Louis, and 7.75c, New York, and St. Louis, although there have been small resale offerings, mainly of May shipment, at slightly less. The American Smelting & Refining Co. continues to quote 7.50c, New York, and 7.42½c, St. Louis.

The aluminum market continues dull, with No. 1 ingots in carload lots quoted at 59 to 61c, for prompt shipment.

The antimony market has sold off during the week due to arrivals which have increased the available supply in this market. Demand has been only of fair proportions. Spot Chinese and Japanese and domestic are quoted at 40c to 41c, duty paid, New York, and futures also are quoted lower.

Nickel continues in good demand. Shot and ingots are quoted at 45c, per pound, and electrolytic nickel at 45c.

The tin market has witnessed only a fair amount of business lately. Prices have been maintained at high levels due to the difficulty of securing permits for exporting the metal from England, and the consequent fear of sellers here that they might not have enough supplies to make deliveries on their contracts. By reason of arrivals, however, April deliveries seem assured and more spot now is to be had and the prices are lower. Spot is quoted variously at 51c to 52c, New York. Exsteamer prices on futures are: April, 50c; May, 48c; June, 47c, etc. A good demand for all positions featured the market today.

Rush for Heavy Sheets

Causes Usual Differentials to Disappear—Scarcity of Sheet Bars an Important Factor

Youngstown, O., April 18.—Sales of sheets in the valley district are being made over a gradually widening scale of prices. Each day emphasizes with more force the fact that conditions surrounding the inquiry are the governing factors in determining the prices made. The bulk of the inquiries continue to be for those grades and sizes with which the mills are already well filled up and prices well above the normal market range of quotations are being made for this business. On other grades of sheets in sizes which are needed to round out mill schedules, business will be taken at substantially lower figures.

An example of this irregular character of the market is afforded in the case of sales of galvanized sheets during the past week. As previously pointed out, the steady ascension of spelter prices to new high levels has seriously restricted the production of galvanized sheets for months. Lately the increased cost of raw steel has tended to cause greater firmness in this market, despite the serious falling off in demand, which in turn is offset by the decline in production, amounting in the case of some mills to 75 per cent. Yet some sales of galvanized sheets have been closed this week below the minimum of 4.85c, and at the other extreme a sale of about 150 tons for export was made at 7.10c, delivery at the mill's convenience. A quotation of 10c was made on another inquiry which required special forming dies.

The market for blue annealed sheets is also irregular. The usual differentials between the various gages have all been lost sight of in the rush for the heavier sizes. The minimum of 3c, which is now quoted on blue annealed, is the basing price for a large proportion of the quotations made on Nos. 14 and 16 gages, while Nos. 10 and 12 gage are quoted by most makers on a 3.25c base. Mills have found no difficulty in getting business at the latter figure on No. 10 gage particularly. Quotations of 3.50c and 3.60c for No. 10 gage, in some cases, have been snapped up by buyers, where reasonably prompt delivery was guaranteed.

Black sheets, while not displaying the strength of the blue annealed market, are in good demand. The requirements of the automobile and electrical industries, in particular, are not covered and considerable inquiry is also received daily from consumers in other lines. Black sheets are still quoted at 2.90c to 3c.

Operations are being maintained at a good rate, despite the restrictions imposed by the shortage of sheet bars. Some mills shut down for several days at a time, while certain departments in which profits are comparatively low, due to the subsidence of demand for those particular products, are practically closed down. The demands for other lines, however, is so heavy that most mills have been endeavoring to secure all of the sheet bars they have under contract. Actual supplies of raw steel going to the mills average about 65 per cent of the tonnage desired.

Market Irregular

Chicago, April 18.—Much irregularity exists in the sheet market, black sheets, blue annealed and galvanized all being affected in like degree. This condition grows out of the fact that many features have to be considered in the sheet market, width, thickness and quality each having its effect. As a result of this condition, some gages may be obtained at lower prices than others and some sizes likewise. As a general rule it may be stated that the heavier and larger sheets are scarcest, and demand higher prices than lighter gages and narrower widths.

Quotations are unchanged from last week. No. 28 gage, black, being and No. 10 gage, blue annealed, at 3.19c to 3.29c, Chicago mill. No. 28 held at 3.09c to 3.19c, Chicago mill, gage, galvanized, may be quoted at 5c, Chicago mill, and upward.

A recent sale of No. 28 gage, black sheets, was made at 3.34c, Chicago, and on the other hand a sale of No. 28 gage has been reported at 4.85c, Pittsburgh. Another sale was said to have been made of No. 10 gage, blue annealed on a basis of 2.75c, Pittsburgh. This was by a mill in Ohio. At the same time, another Ohio mill sold No. 10 gage blue annealed sheets in the east at 3.45c, Pittsburgh.

These irregularities have seemed hard to reconcile, and illustrate the unevenness of the market.

Production Heavy

Pittsburgh, April 18.—Despite the fact that many mills have been forced to shut down in part at least one day of the week on account of the lack of steel, the production of steel sheets is breaking all previous records. Demand is reported to be general, which has enabled manufacturers to keep all mill departments operating at maximum capacity. Specifications for tin mill black sheets are heavy and prices are strong. Irregularity in the market for galvanized products, reported a week ago, seems to have disappeared. Blue annealed sheets are decidedly firm at 3c as a minimum for No. 10 gage.

Don't Want New Business

Philadelphia, April 17.—Large order books continue to restrain eastern Pennsylvania sheetmakers from making many new sales. Such business as is being accepted, however, is at a range of 3.75c to 4.00c, Pittsburgh, for No. 10 gage blue annealed.

Tin Plate Jumps to $5

Pittsburgh, April 18.—Tin plate mills, for the first time in the history of the tin plate industry in this country, now are selling material at $5, base, or $5 a ton above the maximum price of a week ago. Before the formation of the Corporation, 14 x 20 108-pound coke tin plate was imported at prices equivalent to $5.30, New York.

Consumers who covered requirements last autumn at $3.60, base, have since re-entered the market for additional material and they willingly have paid prevailing prices when mills could meet specifications for delivery. Rather heavy tonnages have been sold at $5, base, for export.

Nuts, Bolts and Rivets

Cleveland, April 18.—The demand for nuts, bolts and rivets continues extremely active and it is expected that the prices on nuts and bolts will be advanced before the end of the week.

Bolts and Nuts Strong

Chicago, April 18.—Demand for bolts and nuts continues insistent and the market is strong. Most mills are sold beyond July 1, with demand continuing. Prices are firm and an advance beyond the present price level is expected at any time.

Tremendous Consumption

Pittsburgh, April 18.—Prices of nuts, bolts and rivets likely will be advanced this week. Manufacturers, in many instances, have paid 3.25c for bar stock for nearby delivery. Specifications from car and ship builders involve tremendous tonnages in the aggregate and export shipments are heavy. Most plants are unable to promise deliveries in less than from four to six months.

(*For complete prices see page* 906.)

Bars for Shell Making

Some Difference of Opinion as to Future Demand from Abroad —Need Large Tonnages of Raw Munition Steel

New York, April 18.—Some difference of opinion is expressed among steel makers and munition manufacturers as to the probabilities of further finished shell contracts being placed in this country by European nations, owing to the fact that England and France now have brought their production to a high pitch. Purchasing officers for the Allies and representatives of shell makers who returned from Europe the past week have declared that the outlook for additional shell contracts is not promising. Whether this applies to the large shells as well as to shrapnel, and the smaller sizes, has not been made certain. It is known that some negotiations for 9.2-inch and similar-sized shells recently have been carried on and are reported to have been closed while orders for machinery for the making of such projectiles have been placed by some companies. Whatever the difference of expectations is as to finished shell orders, there is an agreement that large tonnages of raw munition steel will be called for constantly from this country as neither England, France, Italy nor Russia can supply their own needs. At present, there remain unclosed inquiries for several hundred thousand tons of this material, including one lot of 100,000 tons, and another of 60,000, both for export. Prices for large shell rounds are quoted from 3.75 to 4.25c, mill.

Few Offerings in East

Philadelphia, April 17.—Soft steel bars for forward delivery as makers are able, are being sold by at least one mill at 2.50c, Pittsburgh, or 2.65c, Philadelphia, but the policy of most of the leading producers is to offer only occasional lots and stock sizes which are irregular in some respect. Buyers are paying from 2.75c to 3.00c, Pittsburgh, even where the material is not standard, if prompt shipment can be made. Sales of regular bars at 2.75c, Pittsburgh, for delivery at the mills' convenience also are noted. Few, if any, forward contracts for ordinary bars are being accepted by the mills. Bids will be taken April 27 on 400 to 500 tons of four sizes for the Panama canal. A very large tonnage is represented by the aggregate inquiries for rounds for shellmakers now in the market for last half delivery. Most of this is for export. Prices rule from 3.75c to 4.25c, mill. Eastern Pennsylvania makers because of heavy previous obligations can offer little tonnage.

Shell Situation Strengthens

Pittsburgh, April 18.—Heavy demand for steel rails may complicate the situation for shrapnel stock. Many rail mills have been rolling shrapnel bars for six months or longer on contracts taken when the rail market was quiet. This tonnage will have to be diverted to bar mills, if demand for rails continues at its present rate. Steel bars are decidedly firm at 2.50c for delivery at the convenience of the manufacturer and many consumers are paying 3.25c for prompt shipment. Nut, bolt and rivet manufacturers have been conspicuous buyers of bars for nearby delivery. Iron bars are selling at 2.50c and above.

Canadian Inquiry

Buffalo, April 18.—The demand for material under contract is reported by the mills and agencies of the Buffalo district to be the strongest experienced in this district in the past year. It is figured that the high prices being asked for warehouse lots, together with the diminishing stocks held by the jobbers, have caused consumers and jobbers alike to seek additional tonnages, but the mills are holding firmly to the contract quotas.

From Canadian sources an inquiry for 2,400 tons of bar material and other finished lines came into the market seeking placement for second quarter deliveries. It is not believed that the deliveries desired will be obtained. A number of the selling interests declined to even consider the tendered tonnage.

Bar Demand Slackens.

Chicago, April 18.—Prices on steel bars for domestic use appear to have reached a level where much normal buying is being discouraged. Manufacturers, who do not see an outlet for their product have come to the conclusion, apparently, that it is unprofitable to seek the tonnage at the present prices. The nominal quotation is 2.64c, Chicago mill, with considerable premium for prompt shipment where it is possible to obtain this.

A heavy tonnage of large rounds for munition makers is being offered, but so far no taker has been found. The price offered on this material is considerably above the present range for bars, but under present conditions this is no temptation to mills.

Bar Iron is Strong

Chicago, April 18.—Demand for bar iron in this district continues excellent, and the present quotation of 2.35c, Chicago mill, is strong. An advance is expected, as buyers are anxious to place considerable business, much of which goes into use where soft steel bars formerly were employed. For second half delivery 2.50c, Chicago mill, is being asked. Makers are not anxious to take on material that far into the future and comparatively little tonnage has been booked beyond July.

Hoops, Bands and Shafting

Pittsburgh, April 18.—Cold-rolled steel shafting, it appears certain, soon will be selling at the list price for carload tonnages. Mills have sold considerable tonnage at 10 per cent off the list and as high as 20 per cent above the list has been paid for nearby delivery. Demand for screw stock is decidedly heavy.

Steel hoops are firmly pegged at 2.75c and bands are commanding 2.50c as a minimum. Mills are unable to promise deliveries in less than from three to six months.

(*For complete prices see page* 906.)

Lake Season

Is Opening with Fighting of Ice—King Will Soon Load Ore

The opening of the season of transportation on the lakes is proceeding under difficulties, as the ice has been extremely heavy and still is blocking the way. The port of Escanaba is fully opened and it is expected that WILLIS L. KING will be the first steamer to load with ore. At Buffalo, the ice is still solid. An ice-crushing ferry, two steamers and a tug attacked the ice in White Fish bay Wednesday as a part of the plan of those directing the work of breaking channels through to Lake Superior.

Reports indicate that the ice fields over western Superior have moved to the south shore and much open water is reported along the north shore. There is more ice in all the lakes than at the same period last season. It is believed, however, that many boats will sail during the next 10 days.

The Driggs-Seabury Ordnance Corporation, Sharon, Pa., has awarded contracts for a steel building, 40 x 70 feet. The building will be used for the storage of patterns and machinery specifications.

Very High Plate Prices

Indicate Continued Strong Demand—Pennsylvania Railroad Buys Large Tonnage at High Figure—Navy in Market

Philadelphia, April 17.—Remarkably high prices reflect a continuation of the extraordinary demand for plates which is beyond the capacity of eastern Pennsylvania makers to satisfy. The Pennsylvania railroad paid two or more eastern makers 3.65c and 3.75c, Pittsburgh, for a round lot of car plates for third quarter just placed, which it is thought totaled about 10,000 tons. An order for 600 tons for June-July delivery to a buyer in Nova Scotia was taken this week by an eastern mill at 4.00c, Pittsburgh. The buyer received quotations from only two makers, the others being unable to figure. Over 4.00c, Pittsburgh, continues to be paid in some cases. Some eastern mills are practically out of the market on any considerable tonnage for the remainder of the year. Considerable new business is being declined constantly. The navy department took bids this week on about 750 tons of plate, shapes and bars for eastern yards and has asked for about 3,500 tons for western yards, bids to go in next week. Deliveries as the mills are able are specified. A Roanoke, Va., bridge shop inquired for 1,500 tons. The Southern railway recently placed about 1,200 tons, of which a portion went to eastern Pennsylvania makers. It is reported a large tonnage of plates is in the market for a new ship yard.

Plate Demand Heavy

Pittsburgh, April 18.—Reports emanating from the east to the effect that railroads are cancelling orders for equipment appear to be unfounded. Manufacturers of car material say car builders are urging shipments more vigorously than ever. In many cases, premium prices are being offered for prompt delivery.

Prices of steel plates continue to harden. No trace of quotations below 2.75c for delivery at the convenience of the mill can be found. Consumers are paying 3.50c and above for nearby delivery and as high as 4c has been paid in a number of instances. One of the larger manufacturers of plates in the Greater Pittsburgh district is asking 3.50c as its minimum price.

Making Prices Up

Cleveland, April 18.—One local mill which had been selling plates as low as 3.25c has now estabished 3.50c as the minimum and is making contracts up to Jan. 1. Another mill is quoting 4c, but has only very wide widths for sale. A leading eastern mill is now quoting 4c for January delivery.

Plate Supply Depleted

Chicago, April 18.—Even warehouse stocks have been depleted and consumers find it impossible to obtain supplies from any source. This has had the effect of causing many railroads to withdraw their inquiries for freight cars, as delivery could not be obtained until 1917. For small work, boilers and tanks, makers without a supply in their yards find it difficult to obtain material with which to finish contracts now on the books. The nominal quotation is 2.94c, Chicago mill, which is a deterring factor for any projects except where it can be used on contracts on the present basis.

A few mills are able from time to time to take on small tonnages for reasonably prompt delivery, and for this are able to obtain heavy premiums over present quotations.

Cast Iron Pipe

American Shops Find Strong Competition for South American Business

New York, April 19.—South America continues to offer numerous opportunities for business to American cast iron pipe makers, but inability to get reasonable freight rates makes it difficult to compete against the British shops. The latter, it now is learned, with their great advantage in ocean freights, because of the control of shipping, have taken the approximately 30,000 tons for Buenos Aires upon which American foundries recently bid. On a new inquiry for 2,000 tons for Rio Janeiro a rate of $40 per ton, from southern ports, was named. British foundries are reported to be paying $14 to $15 per ton, across. R. D. Wood & Co. have been able to obtain 1,050 tons of 4 to 12-inch for Puerto Columbia, United States of Columbia, through that government furnishing its own vessel. Closing of the large requirement for Uruguay, which was financed in this country, now made, gives about 5,000 tons of 4 to 30's to the American Cast Iron Pipe Co., and 2,500 tons with the United States Cast Iron Pipe & Foundry Co. About 7,500 tons additional are to be placed. On the rebidding of 2,425 tons for Niagara Falls the United States Cast Iron Pipe & Foundry Co. is low at $32, delivered, for the 4's, and $29, delivered, for the 6 to 36's. New York City took bids on 475 tons of 8's for the borough of Queens, and on 315 tons of 8 to 12's for Manhattan. Rochester took bids April 19 on 12,000 tons of 37-inch. The market continues of good volume and prices are steady.

Still Slow in West

Chicago, April 18.—Cities continue to remain out of the market for cast iron pipe, doubtless on account of present high prices. Bids were opened at Highland Park, Mich., April 17, on 1,400 tons. This is practically the only inquiry of size now before makers.

An interesting feature of the cast iron pipe market is the fact that where demand for pipe to go into water works extensions has been reduced to a minimum shops are unusually busy making specials and flanged pipe for industrial works, particularly those making chemicals. This demands special prices and is serving to fill in part of the capacity not taken by ordinary demands for water works use.

Most pipe shops have assortment of pipe already on hand sufficient to fill routine demands from contractors and small towns.

Cities Buy Slowly

Birmingham, April 18.—Makers of water and gas pipe, while acknowledging that municipalities are backward in accepting the advanced prices, report satisfactory current business and forward order books well taken care of. J. R. McWane, president of the American company, is back from a three months' business trip to South America. He reports a pipe market there that is limited only by ship room. Some Porto Rican and Cuban pipe business has failed of delivery on account of lack of ships. The labor troubles in the Anniston pipe field continue and recently spread to the shops of the Anniston Ordnance Co. Soil pipe operations are not at normal.

Receivers Appointed

The South Side Trust Co., Pittsburgh, and David N. Carlin have been appointed temporary receivers of the Thomas Carlins' Sons Co., Pittsburgh. An application for receivership was filed by Harriet A. Carlin, executrix of the estate of William J. Carlin, deceased. A hearing for the appointment of a permanent receiver is set for Saturday, April 22.

(*For complete prices see page* 906.)

Coke Prices Soft

Connellsville Market is Weak and Irregular

Pittsburgh, April 18.—The Connellsville coke market is weak and irregular. The output of fuel has been heavy and considerable tonnage, shipped from the regions several weeks ago, now is being delivered. Standard blast furnace fuel has sold at as low as $2.25, ovens, and reports of sales at $2, ovens, for prompt delivery have been heard. Demand has been light. Furnace coke for second half shipment, previously held at $3, ovens, has been obtained at slightly less than that figure this week. Seventy-two hour coke is quiet, but prices are firm. The *Connellsville Courier* says production of coke in the upper and lower Connellsville regions the week ending April 8, was 465,644 tons, compared with 476,995 tons the week previous.

Coke Steady

Cincinnati, April 18.—Contracting for foundry coke continues brisk and the tonnage being placed for delivery after July 1 is heavy. The majority of foundries in this territory have already bought for yearly requirements after July, and practically all of the others are in the market. No inquiries are out for furnace coke, but heavy shipments are being made on old contracts. Wise county foundry coke is quoted at from $3.50 to $3.75, ovens, and the same grade from the Pocahontas fields is quoted at from $3.25 to $3.75, ovens, both for contract delivery.

Low Price on Furnace Coke

Cleveland, April 18.—Contracting for foundry coke has nearly ceased and there is very little activity at the present time in either foundry or furnace grades. A furnace interest was offered some coke within a few days at $1.70, ovens. This is not regarded as a fair market quotation, as the coke had been loaded on cars and the seller was anxious to dispose of it.

New Form of Contract

Chicago, April 18.—As a result of conditions in the coke market during the past year, a new form of contract for coke to be delivered during the next year has been worked out. The former custom was for a foundryman to contract for his requirements of coke without a definite tonnage being mentioned. At present, the buyer contracts for his requirements and agrees on a minimum tonnage with the privilege of specifying 25 per cent in excess of this figure. Any tonnage over this maximum is optional with the seller to supply or refuse, depending on his production. This form is considered by buyers and sellers as fair and gives sufficient elasticity to meet most conditions.

Contracts are being made for foundry coke at $6 to $6.10, delivered Chicago, on a basis of $3.50, Connellsville, the freight rate being $2.50 to Chicago. Most coke used in this district is from by-product ovens, little beehive fuel being shipped here.

Boiler Tubes

Advanced $8—Oil Counry Goods Also Marked Up

Pittsburgh, April 18. — Effective April 15, the National Tube Co. advanced lap-welded hot-rolled boiler tubes four points, or about $8 a ton for less than carloads; oil country goods, including tubing, casing, drive and 2-inch line pipe, were put up $2 a ton. The A. M. Byers Co. on the same date advanced wrought iron oil country material about $2 a ton, and manufacturers of iron boiler tubes are expected to put up quotations about $8 a ton at an early date. No general change has been made in the price of standard merchant pipe, although an independent manufacturer in the Wheeling district today notified the trade of a $2 advance in the price of black and a $4 advance in the price of galvanized merchant pipe. That standard merchant pipe will be advanced generally this week is the belief of the trade.

The last previous advance in boiler tube prices was made March 29; boiler tubes have been advanced $24 a ton since Jan. 1 and are commanding $36 a ton above the price prevailing May 1, last. Demand for standard pipe, oil country goods, boiler tubes and seamless tubing continues decidedly heavy and few mills are in a position to meet specifications for delivery in less than from three to six months.

Cold Rolled Bars Advanced

Cincinnati, April 18. — Warehouse business is brisk and prices are very strong. Cold-rolled steel bars, round, square, flat and hexagon, have all been advanced to 20 per cent plus the list price, which is from 10 to 12 per cent above last week's figures. Hot rolled bars are unchanged at from 3.20c to 3.75c, and shapes and plates at from 3.20c to 3.50c. Warehouse prices on sheets are as follows: No. 10 blue annealed, 3.50c; black No. 28, 3.90c, and galvanized No. 28, 5.65c.

(*For complete prices see page* 906.)

Billet Buying

Includes Tonnages of Inferior Grade at High Prices

Philadelphia, April 17.—There seems to be more selling of irregular and off-cast billets and blooms by various makers at present than of standard material, since the offerings of the latter are very limited. Regardless of the irregularity of size and analysis of these mixed lots, there appears to be a market for all of them at very good prices. Sales of blooms of this character at $47.50, Pittsburgh, or about $50, delivered in this territory, are noted. Recent sales of shrapnel bar discards suitable for rerolling were made in this territory at around $42, Ohio mill, but a tonnage still is being offered by other interests at much lower or at $38, delivered. Prices of eastern makers for regular billets are from $50 to $55, mill for rerolling and $65 to $75, mill, for forging steel. A new Crum Lynne, Pa., producer of semi-finished material is expected to be offering soon.

Forging Billets Sold at $85

Pittsburgh, April 18.—Prices of semi-finished steel products are, if changed at all, stronger than a week ago, but not enough tonnage has been sold to offer an accurate line on the situation. Bessemer and open hearth billets and sheet bars are quoted at a range from $45 to $50, Pittsburgh. At least one manufacturer has sold forging billets at $85 a ton. Some tonnage was offered a few days ago at $65 a ton and that figure appears to represent the minimum price. A fairly heavy tonnage of muck bar was purchased recently at a price equivalent to about $40, Pittsburgh.

Mills Sold Up

Youngstown, O., April 18.—The market for semi-finished materials continues quiet. Mills are sold up to a degree that precludes the assumption of more business. There is little prospect of renewed activity in sheet bars until sheet mills begin to cover for last quarter delivery. Inquiries continue to come in for off-heat and discarded metal. The steel output of this district will be increased within two weeks by the addition of two 90-ton open hearth furnaces at the Brier Hill Steel Co. plant. One furnace will be ready by May 1 and the second a few days later. This gives the Brier Hill company 10 open hearth furnaces.

William A. Martin, 42 years old, manager of the Universal Rolling Mill Co., Bridgeville, Pa., died April 12, at Aberdeen, Md., where he was born.

Ore Sellers

Have Difficulty in Disposing of High Phosphorus Grades

Cleveland, April 18.—The tremendous producing capacity of the Lake Superior region is shown by the fact that although great tonnages of both bessemer and non-bessemer ores have been sold for delivery this year, the sellers are now having much difficulty in disposing of high phosphorus ores. These ores are, of course, entirely out of the question as far as makers of bessemer steel are concerned and even for open hearth, low phosphorus ores are preferable. Although nearly all foundries are very busy, the principal demand is for ores suitable for making steel. In some cases, the prices on high phosphorus ores have been cut 15 to 20 cents per ton below the regular schedule and still large tonnages remain unsold.

Wire Advance

At an Early Date is Probable—Activity Continues

Cleveland, April 18.—The wire market is very strong and another advance is expected at an early date, possibly this week. Plain wire has been sold in Cleveland as high as $2.50 and buyers are clamoring for more than mills are willing to sell. The outlook is that there will not be the usual decrease in business during the summer.

Very Heavy Demand

Pittsburgh, April 18.—After numerous rapid-fire advances, extending over a long period, the market for general wire products has showed no change in position since March 1, when an advance of $2 a ton was announced. Demand for wire products has been extremely heavy and some mills have been obtaining $2 a ton above the general market. In past years, the summer months have been dull and inactive and some people in close touch with the situation do not believe prices of wire products will be put up further until buying for autumn delivery begins.

Specifications are coming out in heavy volume and buying for foreign shipment continues active. Shipments of barb wire to the western theater of war in Europe are not nearly so heavy as they were six months ago, but exports of general products to South American and far eastern countries gradually are becoming heavier.

Electrical patents and improvements were discussed April 15, by members of the Association of Iron and Steel Electrical Engineers at the regular monthly meeting, held in the Fort Pitt hotel, Pittsburgh. The association plans to establish a Cleveland section, May 6.

Pure Benzol

Is in Active Demand and Buying Movement is Expected

New York, April 18. — Buyers of pure benzol, largely of the domestic class, have put forth a heavy demand and leading sellers believe this interest indicates the inception of an important buying movement. Consumers apparently have concluded that war conditions which have caused the current high prices for benzol are not likely to be terminated soon. Many of them are inquiring for 12-month contracts, starting from the present date. Sellers report they are in a position, with new production constantly coming in, to start immediate shipments on a limited amount of new contract business. Prices have not been affected as yet by the increased demand, but the undertone is stronger and resale offerings which recently have been disturbing the market are being absorbed rapidly. Further advances are expected. Tuluol and solvent naphtha are unchanged. There is not much new demand for these products, as users are well supplied and prices are staple.

Twelve-month contracting of sulphate of ammonia by fertilizer manufacturers, which usually is under way at this date, not yet has appeared, and the market is backward. Offerings by second hands still disturb the market as they usually are being offered at some concession from the schedule of leading sellers.

The current quotations per gallon at the maker's plant on leading coke oven by-products are as follows:

Pure benzol, spot	$0.80
Pure benzol, contract	.70
Tuluol, spot	4.75
Tuluol, contract	4.50
Solvent naptha, spot	.45 to .50
Solvent naptha, contract	.40 to .45

Sulphate of ammonia is $3.50 to $3.55 per 100 pounds at tidewater.

Cold Rolled Strip Steel

Pittsburgh, April 18.—Active demand continues for cold-rolled strip steel, which continues to be sold at 6c, base, and above for second half delivery. Mills in a position to meet specifications for prompt shipment have no difficulty in obtaining as high as 6.50c. The scarcity of billets has made it impossible for all strip steel manufacturers to operate at desired capacities.

(For complete prices see page 906.)

Home-Made Ferro

Promises to Relieve the Tension for Early Delivery

New York, April 18.—Plans for increasing the domestic output of merchant ferro-manganese and spiegeleisen, previously announced, rapidly are being brought to an operating stage, and it is believed that the enlarged production will have a tendency to ease the tension in the market of these metals for early delivery. The North Cornwall, Pa., furnace of the Lackawanna Iron & Steel Co. has been started on ferro-manganese with very satisfactory production results. This furnace will make ferro-manganese for the Lackawanna Steel Co. and E. J. Lavino & Co., Philadelphia, under a conversion arrangement. The latter firm will start on ferro-manganese in about two weeks at the Sheridan, Pa., furnace, recently acquired, and about a month later, the furnace of the Lebanon Valley Furnace Co., Lebanon, Pa., which has been leased. While most of these operations are well sold up, it is thought some early metal may be offered. An eastern manufacturer of spiegeleisen is carrying on negotiations for increasing his output by conversion arrangements with several furnaces.

The ferro-manganese market continues quiet. Some English ferro-manganese for last half may be had at $300, seaboard, and for fourth quarter at $200, seaboard. Reports have been current in the market of some offerings of 70 to 72 per cent English ferro-manganese for last quarter at $167.50, seaboard. For first half of next year, the price of English metal remains $175, seaboard, and there is some further selling at that figure. Offers on some lots of misfit English ferro-manganese and spiegeleisen, which would be available for early shipment, are being solicited by sellers. Prompt ferro-manganese is very strongly held at $400 to $450, seaboard, but there are few sales. Domestic 20 per cent spiegeleisen is quoted at $60 to $65, furnace, for last half. Higher prices than these are asked for early delivery. Buying has been less active.

Manganese Ore Imports

Washington, April 18. (By wire.)—The importations of manganese ore by tons in February, 1916, were 8,685, and for the eight months ending February, 1916, they were 281,170 tons. In February, 1915, only 27 tons were imported and in the eight months ending February, 1915, the imports were 150,587 tons.

Rail Order is Distributed

By the Pennsylvania Railroad—Order Largest in Many Years, if Not in History—New Car Orders

New York, April 18.—Distribution of the rail order of the Pennsylvania railroad for 1917 delivery, placed several days ago, now is understood to include 90,200 tons to Steel Corporation mills, 45,100 tons to the Cambria Steel Co.; 57,400 tons to the Bethlehem and Pennsylvania Steel Cos., together, and 12,300 tons to the Lackawanna Steel Co. This is practically the same division that has been made by this system for several years past. The total of 205,000 tons of the Pennsylvania is the largest in recent years, if not in history. It compares with 175,500 tons in 1915; 147,138 tons in 1914; 178,078 tons in 1913; 151,391 tons in 1912; 111,799 tons in 1911; 162,790 tons in 1910; 137,665 tons in 1909; 31,563 tons in 1908; 149,878 tons in 1907; 163,797 tons in 1906; 128,095 tons in 1905; 110,591 tons in 1904, and 156,532 tons in 1903. The specifications under which the 1917 rails of the Pennsylvania system will be ordered, have not yet been issued to makers and may be the subject of later negotiations. The Interborough Rapid Transit Co. is inquiring for 6,000 tons additional of running rails, increasing its total inquiry to 9,500 tons and the aggregate of that now in the market for rapid transit lines in New York City, to 20,000 tons. The Havana Central has inquired for 5,000 tons.

The equipment market has been quieter the past week, but some inquiries of liberal size remain pending, especially for foreign systems. New orders of the past week include:

Southern Railway, 45 coaches, 18 passenger baggage, 19 baggage express, 10 baggage mail and five club to the Pullman Co.

Long Island railroad, 15 refrigerators to the Standard Steel Car Co.

Louisville & Nashville, 450 box car underframes and 400 gondola underframes to the Pressed Steel Car Co. New inquiries include the following:

Birmingham & Southern, 15 hoppers, 20 flats, 15 box.

Ocean Shore railway, 20 flats, 30 gondolas.

La Belle Iron Works, 10 hoppers, 5 tank.

Toledo Railway & Light Co., 25 to 100 street cars.

The American Locomotive Co. has received orders for 10 locomotives for the Norfolk & Western, 10 from the Kansas City Southern, four from the Long Island railroad and one from the Solvay Process Co. The Reading order, placed with the Baldwin Locomotive Works, calls for 26 locomotives.

Roads Seeking Rails

Chicago, April 18.—Following announcement by the United States Steel Corporation and other rail makers that standard rails will be sold at an advance of $5 per ton, heavy demand from railroads became manifest. The western mill already had sold more than it can deliver to May 1, 1917, and has been unable to take any of the new tonnage offering.

Confirmation of the former sale of 40,000 tons to the Rock Island railroad has been given by the federal court in charge of the receivership over this road.

The Pennsylvania railroad has placed 205,000 tons of steel rails for 1917 delivery, of which 90,000 tons go to the leading interest and will be divided between the Pittsburgh and Chicago mills.

The Rail Advance

Pittsburgh, April 18.—The announcement April 13 that the United States Steel Corporation had advanced standard railroad sections $5 a ton for delivery after May 1 caused little or no surprise in the general trade, since this step was presaged 10 days or a fortnight ago. As pointed out in *The Iron Trade Review*, April 13, the price of standard railroad sections had not been changed since May, 1901, it having been the general custom to give the railroads the advantage of a stable market. The price of standard sections in the future, it is generally understood, will be regulated or controlled by supply and demand, as is the case with other steel commodities.

Steel rails will continue to be sold on the 100-pound basis, as has been the custom for the last half decade. Both bessemer and open hearth sections were advanced 22½ cents a pound, the former now being listed at 1.47½c and the latter at 1.56½c per pound, representing an advance of $5.04 per long ton.

The Pennsylvania railroad last Friday placed one of the largest orders for rails in its history, taking 205,000 tons for delivery in 1917. The tonnage was obtained at the old price.

It is likely that light rails, demand for which is heavy, will be put up further at an early date. Standard spikes are selling at 2.65c and above. Other track fastenings are unchanged in price.

(*For complete prices see page* 906.)

Scrap is Weak

With Chicago Marking Time and Little Pittsburgh Activity

Pittsburgh, April 18.—An extended period of inactivity has tended to weaken temporarily the market for iron and steel scrap in western Pennsylvania. The Carnegie Steel Co. has not figured in the market for about a month and other prominent consumers have not manifested any interest in quotations. Scattering lots of good quality heavy melting stock have been sold at $18 and $18.25, delivered, the last few days, but some dealers have picked up small tonnages at as low as $17.25. Purchasing agents of some of the larger steel manufacturers, however, say that they have not been able to obtain quotations below $18 for large tonnages. Demand for turnings and borings, which have been used extensively by many blast furnace managers for increasing melts, is not so heavy as previously. Generally, prices have showed no important change in position this week.

Scrap Market Quiet

Chicago, April 18.—The iron and steel scrap market in Chicago is marking time with quotations practically at the level which has prevailed for the past fortnight. Consumers are not taking material and practically all transactions are between brokers, who are covering their short sales in the recent buying movement.

A shortage of heavy grades is apparent, shipments on contracts are sometimes difficult to fill and an unusual number of rejections have been made recently at the Gary mill, which would indicate a tendency of shippers to substitute something else where possible.

Unusually active operations of machine shops, especially on munitions, have resulted in large offers of borings and turnings and this unusual supply has weakened the market. Machine shop turnings are quoted at $7.75 to $8.25 and cast borings at $7.25 to $7.75.

Railroad offerings this week are few and small. The Grand Trunk railroad offers 1,300 tons, the Monon railroad 1,013 tons, the Chicago, St.

Paul, Minneapolis & Omaha railroad 1,080 tons, and the Soo Line 440 tons.

Higher Prices Expected

Buffalo, April 18.—The local scrap market for the time being seems to be quiet with heavy melting steel quoted at $17.50 to $18. The feeling seems to prevail among the dealers, however, that the entire list is due to firm up in a short space of time; consequently no effort is being made to move large tonnages. Embargoes placed by a number of plants on various lines in the list have had a tendency to minimize the activity for the week.

Some Sharp Bidding

New York, April 18.—Sharp bidding for such grades as heavy melting steel and No. 1 railroad wrought on recent railroad lists by dealers and brokers, stands as an offset against reports of weaker conditions in some scrap materials. For No. 1 railroad wrought, bid of $24.50 did not obtain the award, and on heavy steel the equivalent of $18.50, delivered eastern Pennsylvania, recently was paid to the railroads by brokers. The grades for which there is a local consumptive demand, such as foundry scrap, are in demand and prices hold. Turnings and wrought pipe are weaker. It is thought that the price recession in some grades is only temporary, being due to more material being offered than can be absorbed at the moment.

Easier in the East

Philadelphia, April 18.—Liberal offerings plus the restricted buying which has been forced upon consumers because the limits of their handling facilities have been reached have produced an easier condition of the old material market. Prices in several grades are 25 to 50 cents less, among the affected items being wrought pipe, forge, stove plate and turnings. Consumers seem to be taking in all the scrap they can handle, which is of less amount than usual, because of shortages of labor, trackage, storage room, etc., and the fact that demurrage rates are higher makes them unwilling to buy anything they cannot pass along readily.

Slow at Cincinnati

Cincinnati, April 18. — The iron and steel scrap market is slow and weak. Prices are unchanged, but a decline is expected before the end of the present week, unless conditions change. Neither rolling mills nor foundries are buying. The former are taking fair lots on old contracts, but foundries are still adopting the hand to mouth policy of covering their requirements.

Bridge Contracts

Form a Large Part of the Awards of the Past Week

New York, April 18.—Letting of new work in this district show a good volume and railroad bridge contracts represent a liberal proportion of the tonnage. Small awards still predominate, indicating that buyers hesitate to put through large projects at today's prices. There are some of the latter, however. The attitude of buyers to guard their plans carefully and to give out little information, still is noticeable. New inquiries have been put out for five to six apartment houses in this city, requiring 5,000 to 5,000 tons, but few details are announced. Plain material prices are firm at 2.50c to 3.00c, Pittsburgh, or 2.669c to 3.169c, New York.

Important Projects

Philadelphia, April 17.—Some important tonnages of structural steel for new work are being figured upon quietly and announcement will be made shortly. Large new undertakings in this territory are not many, due, undoubtedly, to price influence. Small jobs remain very numerous and represent a very fair tonnage. Specifications to eastern mills continue heavier than shipments and these increasing obligations cause makers to be more cautious in selling. Many customers continue to over-specify their contracts for the current quarter. These excesses are listed against the succeeding quarter's contract and where the buyer has no such contract to his credit, they are being entered as new business, at 3c, Pittsburgh. An eastern maker has entered an order for 4,000 tons of plain material for export. Prices are unchanged at from 2.50c to 3c, Pittsburgh, or 2.659c to 3.159c, Philadelphia.

Lake Shore Inquiry

Cleveland, April 18.—The Lake Shore railroad is in the market for several thousand tons of bridge material and some fabricators are returning the inquiry stating that they are unable to quote.

Structural Sales Restricted

Chicago, April 18.—A noticeable change has taken place in the class of projects on which contracts now are being made. Instead of mercantile and office buildings and other projects of investment character, lettings now are mostly for railroad, mining, manufacturing and public buildings.

In the list of contracts placed in the west during the past week, every item falls into these classifications and nothing of a private nature was placed. The total tonnage contracted in the west is 3,600 tons, two items of which were in excess of 1,000 tons and one over 500 tons.

(*For complete prices see page* 906.)

CONTRACTS AWARDED.

Steel barges for Mengle Box Co., Louisville, Ky., 1,000 tons, awarded American Bridge Co.

Addition to Gillsy Hotel, Cleveland, 575 tons, to American Bridge Co.

Building for Lorain County Savings & Trust Co. Elyria, O., 325 tons, to American Bridge Co.

Building for J. B. Brooks Jr., Detroit, 300 tons, to American Bridge Co.

Addition to Webb Terminal, Philadelphia, 500 tons, to the Jones & Laughlin Steel Co.

Bridge work for the Southern railway, 1,750 tons, including 800 tons to the American Bridge Co., 500 tons, to the Fort Pitt Bridge Works, and 450 tons to L. F. Shoemaker & Co.

Bridge work for the Maine Central, 550 tons, divided between the American Bridge Co. and independent shops.

Bridge work for the New York Central, 250 tons, to independent shops.

Shop building for the Seaboard Air line, Howells, Ga., 160 tons, to the American Bridge Co.

Bridge work for the Virginian railway, 115 tons, to the Virginia Bridge & Iron Works.

Additions to the plant of the Staten Island Shipbuilding Co., Staten Island, N. Y., 400 tons, to Milliken Bros., Inc.

Scribner loft building, West Thirty-eighth street, New York City, 600 tons, to Geo. A. Just.

Berkley Arcade building, West Forty-fourth street, New York City, 3,000 tons, to the Hay Foundry & Iron Works.

Carpenter apartment, Sixty-sixth street and Park avenue, New York City, 800 tons, to the Hinkel Iron Works.

Convent, East Eighty-sixth street, New York City, 300 tons, to the Hinkel Iron Works.

Repairs to Parliament building, Ottawa, Quebec, 1,500 tons, to the Dominion Bridge Co.

Fahnestock residence, East Sixty-sixth street, New York City, 200 to 300 tons, to the Hinkel Iron Works.

Minneapolis, St. Paul & Sault Ste. Marie railroad, ore dock, Ashland, Wis., 1,625 tons, to Minneapolis Steel & Machinery Co.

City of Seattle, Wash., highway bridge over Lake Washington canal, on Eastlake avenue, Seattle, Wash., 1,060 tons, to American Bridge Co.

Yates Machine Co., machine shop, Beloit, Wis., 509 tons, to Lakeside Bridge & Iron Works.

Oliver Iron Mining Co., shaft sets for Norrie Aurora mine, Ironwood, Mich., 208 tons, to American Bridge Co.

CONTRACTS PENDING.

Highway bridge for the State of New York, over Androut creek, near Newburgh, N. Y., 500 tons, bids being taken.

Piers for the city of New York at Fifty-sixth and Fifty-seventh streets and Hudson river, about 3,000 tons, bids being taken.

Residence for E. T. Stotesbury, Chestnut Hill, Pa., 200 to 300 tons, bids being taken.

Office building for the Bush Terminal Co., West Forty-second street, New York City, 3,000 tons, contract pending. Report that award made to Post & McCord and the American Bridge Co., not confirmed.

Additions to the plant of the National Sugar Refining Co., Brooklyn, 500 tons, bids entered.

Addition to Gillsy House, Cleveland, 500 tons.

Lorain County Savings & Trust Co. building, Elyria, O., 450 tons.

Heavy Increase

In Exports in February—Iron Ore Imports Show Larger Tonnage

The statistical report of the bureau of foreign and domestic commerce for February shows that the exports of iron and steel products reported on a tonnage basis were the largest since August of last year, the figures being 405,850 tons in August, 1915, and 398,445 tons in February, 1916. Comparing February of this year with the same month in 1915, this year shows a very decided increase, the exports for February, 1915, being only 145,820 tons.

Imports show an increase in February over January, but the tonnage is not important compared with exports. The imports of iron ore were 93,315 tons in February of this year, compared with 78,773 tons in February, 1915. Imports of manganese oxide and ore were only 27 tons in February, 1915, compared with 16,648 tons in January, 1916, and 9,849 tons in January, 1915. Statistics of manganese ore imports for February are not yet available.

Some further statistics are published in regard to exports of machinery for January, showing the value of motor trucks to be $3,416,818; for agricultural implements, $1,139,874, and $3,249,595 of metal working machinery. No aeroplanes were exported in January. Exports of zinc for January, 1916, were valued at $4,745,632, compared with $2,005,207 in January, 1915.

IRON AND STEEL EXPORTS, GROSS TONS.

	February,		Eight months ending February,	
	1916.	1915.	1916.	1915.
Scrap	9,371	3,017	84,866	13,627
Pig iron	15,061	14,178	171,708	66,453
Billets, ingots and blooms of steel	87,306	15,697	506,461	55,295
Wire rods	13,763	10,865	111,817	43,369
Steel rails	34,630	9,124	371,817	82,983
Steel bars	53,890	15,761	371,118	97,119
Iron bars	5,174	658	41,585	4,068
Struc. iron and steel	18,880	12,733	180,304	102,033
Hoops, band and scroll	4,559	1,161	27,136	7,206
Sheets and plates	37,493	19,975	329,234	158,349
Tin & terne plates	13,587	5,834	133,386	45,849
Barbed wire	29,575	5,874	222,612	73,430
All oth. wire	45,327	18,502	186,527	74,851
Cut nails	176	193	2,944	1,356
Wire nails	9,522	3,811	77,014	30,031
All oth. nails incld. tacks	457	435	6,636	2,421
Pipes & fit'gs	11,624	5,956	118,501	111,902
R. R. spikes	4,161	547	16,656	3,696
Bolts, nuts, rivets and washers	2,736	1,000	21,496	8,374
Horseshoes	958	326	9,876	6,028
Cast radiators	195	173	1,703	2,037
Total	398,445	145,820	2,993,397	990,477

IRON AND STEEL IMPORTS, GROSS TONS.

	February,		Eight months end'g February,	
	1916.	1915.	1916.	1915.
Scrap	5,052	2,050	75,986	23,456
Pig iron	10,175	1,687	77,039	82,646
Ingots, blooms, billets of steel	3,169	644	12,018	20,463
Wire rods	449	324	3,024	2,706
Rails	762	419	39,187	15,261
Bar iron	206	1,734	5,009	8,483
Structural	192	240	932	5,176
Sheets & plates	167	151	1,120	2,156
Tin and terne plate	107	265	450	4,555
Total	20,279	7,514	214,765	164,902

IRON ORE IMPORTS, GROSS TONS.

	February,		Eight months ending February,	
	1916.	1915.	1916.	1915.
Spain	31,200	.....	57,334	46,115
Sweden	9,491	19,566	129,601	137,099
Canada	1,224	2	83,122	36,433
Newfoundland & Labrador	.....	.....	.....	17,500
Cuba	36,200	47,105	574,739	501,121
Oth. countr's	15,200	12,100	128,073	57,334
Total	93,315	78,773	972,869	795,602

EXPORTS OF MACHINERY.

1915.	Motor trucks.	Agricultural implements.	Aeroplanes.	Metal working machy.
June	8,578,802	854,670	283,212	3,735,562
July	6,803,001	963,534	880,836	3,872,358
Aug.	4,387,193	1,454,606	588,600	3,624,411
Sept.	5,882,255	1,092,797	101,950	3,256,973
Oct.	4,307,190	791,230	366,892	3,236,079
Nov.	3,837,307	1,054,235	13,770	4,644,713
Dec.	3,920,533	1,338,629	156,347	3,205,788
1916.				
Jan.	3,416,818	1,139,874	.....	3,249,595

IMPORTS AND EXPORTS.

1915.	Imports, gross tons.	Exports, gross tons.
July	20,858	378,890
August	27,556	405,850
September	23,345	381,914
October	34,730	351,039
November	37,131	362,764
December	35,456	353,836
1916.		
January	15,824	354,416
February	20,279	398,445

Stock Market

Fails to Respond to Cheerful Industrial News

Last week was another period in which cheerful news from the industrial world seemed to have little effect on the stock market and most of the industrial stocks recorded net declines.

The market opened Monday stronger than it was at the close of the preceding week, but the announcement at noon of the wonderful showing of unfilled orders of the United States Steel Corporation had little if any, effect on the general list.

Tuesday the slow market was attributed to the fear of complications with Berlin reaching an acute crisis. Announcement was made that the British government had closed for 400,000,000 pounds of copper and the Midvale Steel & Ordnance Co. was reported to have closed with the British government for 100 howitzers at $127 each. Still the stock market remained apathetic.

Wednesday the market was languid, and Thursday the news in regard to Mexican and German complications was blamed for the downward trend of quotations. The American Railway Association's idle freight car compilation for April indicated a surplus of 3,650 cars, against a shortage of 20,551 a month earlier.

There was a slight recovery Friday and a somewhat more optimistic feeling Saturday. Reports as to bank clearings and railroad earnings were very encouraging.

Quotations at the close of business April 15 and changes in the leading stocks identified with the iron and steel industry for the week are shown in the following table:

	Close Apr. 15.	Net chg.
American Can	59	—1
American, Can, prfd	112	+ ⅛
Amer. Car & Fdy	66⅜	—1⅜
American Locomotive	72⅝	—4¾
American Locomotive, prfd	101⅜	— ⅞
American Steel Foundries	50	—2½
Baldwin Locomotive	101⅜	—3⅜
Baldwin Locomotive, prfd	108½	— ⅛
Bethlehem Steel	468½	—10½
Colorado Fuel & Iron	42⅞	—1¼
Continental Can	83	—1
Crucible Steel	88¼	—3⅜
Crucible Steel, prfd	116½	.....
General Electric	165	— ½
International Harv. of N. J.	110⅜	— ⅜
Intern. Harv. of N. J., prfd.	119½	+ ⅛
International Harv. Corp	73	+1
Lackawanna Steel	75	—2½
Nat'l. Enamel'g & Stamp. Co.	23½	—1⅛
Pressed Steel Car	50½	—1½
Pressed Steel Car, prfd	102	—1
Pullman Palace Car	161½	—1½
Republic Iron & Steel	49⅝	—1⅛
Republic Iron & Steel, prfd	108¼	— ⅜
U. S. Cast Iron Pipe & Fdy.	20¼	—1¼
U. S. C. I. P. & F., prfd	50¼	—1
United States Steel	83⅛	—1⅜
United States Steel, prfd	117⅛	.....
Westinghouse Mfg.	62½	—1¼

The following table shows changes in maximum quotations of stocks not listed on the New York stock exchange:

		High Apr. 7
American Radiator	395	395
American Ship Building	46½	46¾
Cambria Steel	81¾	81¾
Chicago Pneumatic Tool	73	74
La Belle Iron Works	55⅛	55½
Lake Superior Corpn	10½	10⅜
Pennsylvania Steel	80	80
Stewart-Warner Speed Co	86⅛	87¼
Warwick Iron & Steel	10¾	10¾
Westinghouse Air Brake	137½	137
Westinghouse Elec. & Mfg.	64¾	66

The Scott Mfg. Co., Elizabeth, Pa., recently organized, has acquired the plant of the United States Safe & Vault Co. The main building is 407 x 175 feet, and is two stories high. John B. Scott, treasurer of the company, is in charge of the plant. Equipment for building special machinery will be installed.

The headquarters of the American Steel Export Co., control of which recently passed to Chas. B. McElhaney and H. W. McAteer and associates, formerly of the Cambria Steel Co., have been removed from the Morris building, Philadelphia, to the Woolworth building, New York City.

Corporation Grateful to Employes

Judge Gary, at Annual Meeting, Reviews Business Conditions and Refers to Youngstown Riots and Indictments

Hoboken, N. J., April 17.—Stockholders of the United States Steel Corporation held their annual meeting here today at the general offices at 51 Newark street. The number of shares represented in person or by proxy was 1,034,981 of preferred and 2,144,798 of common stock. These shares were voted unanimously: In favor of approving and ratifying all purchases, contracts, acts, proceedings, elections and appointments by the board of directors and the finance committee since the annual meeting of April 19, 1915; in favor of approving and ratifying the amendments the the by-laws made by the board of directors April 27, 1915, and March 28, 1916, and of adopting the by-laws as thus amended; in favor of ratifying the elections of Thos. Murray and Geo. F. Baker as directors; in favor of the appointment of Price, Waterhouse & Co. as independent auditors to audit the books and accounts of the Corporation at the close of the fiscal year ending Dec. 31, 1916.

The following were elected as directors for three years ending in 1919: Geo. F. Baker, Jas. A. Farrell, Elbert H. Gary, J. P. Morgan and Geo. W. Perkins. The names of Thos. Murray, Alfred Clifford and Edmund C. Converse have been withdrawn from the directorate, making the number of members of that body 15 instead of 18 as before.

Comments by the stockholders, which have added to the interest at previous meetings, were lacking today, and the only stockholder who delivered himself of any extended remarks was E. R. Smith, a heater at the Canal Dover, O., plant of the American Sheet & Tin Plate Co., who spoke at the personal invitation of Judge E. H. Gary, who, as usual, presided in his capacity as chairman. Mr. Smith, who participated in the annual meeting two years ago, acknowledged a keen interest in the affairs of the Corporation, from the standpoint both of an employe and of a stockholder. He expressed the general satisfaction which is felt by the employes in the treatment which they are accorded by the management.

"The men," said Mr. Smith, "appreciated the fact that the Steel Corporation, in 1913, was the last of the steel companies to reduce wages. The wages of the tonnage men were reduced about 12½ per cent, while those of the common laborers were left unchanged. About nine months later, without any confusion or pressure on the part of the men, the 12½ per cent reduction was restored to the tonnage men and the wages of laborers were increased. During the period of reduced wages, the tonnage men appreciated the fact that their wages continued to be based on the fair and equitable sliding scale, and later, when the reduction was restored, they also appreciated the fact that the Corporation was the first steel company again to move wages upwards. The men are satisfied, regardless of what changes may occur in the future, that their interests are safe in the hands of the men who direct the policies of the Steel Corporation subsidiaries. The men are loyal to the Corporation, are proud of their identification with it, and do not at all share the spirit which has been reflected of late by the employes at some of the steel plants in Ohio belonging to other companies."

Judge Gary's Address

Judge Gary, in an address to the stockholders, commented upon the developments of the past two years. From October of 1913 up to about a year ago, he said, business conditions were worse than ever before in the Corporation's history, so that the Corporation, during that period, was forced to reduce the wages of some of its men. Judge Gary emphasized the fact, however, that although dividends on the common stock were passed, the wages of laborers were not included in these reductions. The Corporation, he said, has reason to feel very grateful to its employes because of their loyalty, and stockholders who are not employes must realize it is to their advantage to have the employes satisfied and contented. Judge Gary recounted the story of the recent labor troubles in the Youngstown district, where strikers from the plants of three steel companies formed mobs, destroyed property and attacked inoffensive citizens. Throughout all the trouble the employes of the Steel Corporation remained loyal. It is regrettable, said Judge Gary, that indictments, which later were dismissed when they came before the court, were returned by the grand jury, charging the Steel Corporation and its chairman, among others, of participating in a conspiracy to raise wages. Even if these indictments had been found true, he said, the Corporation would have been inclined to feel proud, instead of ashamed, of such a charge. Through information from well-informed sources, Judge Gary said, he did not believe that the general community approved of the indictments found by the grand jury.

Judge Gary spoke of the duties of the managers of the Corporation, saying they become very trying at times. It is hard to manage a corporation, he said, so as to keep it out of difficulty, to keep from having to borrow money at a bank and to keep the corporation strong and the plants running continually so that the men employed at them will not be thrown out of work. "I am glad to be able to state," he said, "that our action in passing dividends on common stock during the past year met with no criticism at all on the part of stockholders who were employes and with only a very few criticisms on the part of other stockholders. Some of the latter were in favor of declaring extra dividends. These stockholders must realize that they have the equivalents of such dividends in expenditures for improvements to properties which will keep the Corporation in the front rank. We are spending lots of money. When you read the amounts in the newspapers, you may think them too large. If you were in our place, however, you would do just as we are doing. Business will not always be as good as it is now, and we must safeguard ourselves for the future.

"We rarely spend money to increase our capacity," continued Judge Gary. "We relocate plants in order that they may command growing markets and where the cost of assembling raw materials may be reduced. We spend money to reduce manufacturing costs, and in 98 or 99 cases out of 100, our figures show that these expenditures are wise. We have spent much money developing the manufacture of by-products, which has proved exceedingly profitable."

Judge Gary reported that out of the 250,000 men employed by the Steel Corporation, approximately 50,000 are stockholders.

Millions More for Men

Steel Corporation and Other Companies Advance Wages —Judge Gary Makes Announcement

New York, April 18.—Another voluntary increase of 10 per cent in wages will be put into effect May 1 by the United States Steel Corporation. Chairman E. H. Gary made this announcement this afternoon in the following statement:

"In view of the continuance of prosperous conditions, we have decided to make advances in the wage rates of our iron and steel companies, about 10 per cent, to take effect May 1."

This is the second wage advance to be ordered by the Steel Corporation in a period of three months, a similar increase having been put into effect Feb. 1 of this year. Prior to that time, the last advance was in February, 1913, and amounted to 10 per cent.

It is estimated that the latest wage advance will mean an additional annual outlay of something like $20,000,000. The Feb. 1 advance represented $15,000,000 to $18,000,000 additional.

Wages Advanced

Machinists of the Alliance Machine Co., Alliance, O., were given notice Saturday of an 8-hour day and an increase to 50 cents an hour, effective May 1. The bonus system will be abolished.

Advances at Youngstown

About 20,000 employes of three iron and steel concerns at Youngstown, O., were given notice Saturday of a 10 per cent increase in wages, effective May 1. President James A. Campbell, of the Youngstown Sheet & Tube Co., was the first to announce a wage increase, and a little later in the day President W. A. Thomas, of the Brier Hill Steel Co., and General Manager J. W. Dietrick, of the Republic Iron & Steel Co., also announced a wage advance for all employes. About 9,000 men will be affected at the Youngstown Sheet & Tube Plant, about 5,000 at the Brier Hill plant, and 7,000 at the Republic plant. The employes of the Andrews & Hitchcock Iron Co., at Hubbard, O., also will participate in this raise. The payrolls of the three companies granting the advance will be increased, it is estimated, by at least $1,500,000.

Under this new schedule common labor will receive $2.42 for a 10-hour day. Laborers at the Sheet & Tube and Republic mills at the time of the strike in January were given an advance of 2½c an hour. In addition, employes of the Sheet & Tube company have been promised a bonus, which President Campbell said would not be in any way affected by the present increase if there was sufficient profit at the end of the year to make the payment possible.

Strikers Return

Striking employes at the central furnaces of the American Steel & Wire Co., and the Cuyahoga works, Cleveland, at first refused to accept the wage increase of 10 per cent, which amounts to about 2½ cents per hour, whereas the men had demanded 3 cents per hour increase. After some parleying, however, all of the employes at the Central furnaces and most of those at the Cuyahoga plant went to work. It is believed that the few who are still holding out will return to work in a day or two.

Pump Company Employes Strike

New York, April 18.—At a meeting of the employes at the Harrison, N. J., plant of the International Steam Pump Co., last night, 523 men voted to strike this morning, only 53 voting against such action. The meeting followed the company's refusal to grant a reduction from 54 to 48 hours a week, and other demands. The company, which recently advanced wages, is willing to grant another advance of 10 per cent, but says a reduction in the working schedule to 48 hours would prevent it from filling its contracts on time. Between 1,600 and 2,000 men are employed at the plant.

At the Paterson, N. J., plant of the American Locomotive Co., where a 10-hour day has prevailed, the company yesterday put into effect a nine-hour day and a 10 per cent increase in wages.

No. 2 furnace of the American Manganese Mfg. Co. at Dunbar, Pa., was blown in April 13, after a period of idleness extending over many months. The furnace is operating on spiegelcisen.

Walter Sachs, Petersburg, Va., and several associates are interested in a company which contemplates the erection of a plant for the manufacture of steel products at Hopewell, Va. Details tails of the undertaking have not been publicly announced.

Shell Steel

Is Sought in Large Tonnages by the French Government

New York, April 19. (By wire.)—New inquiries for about 250,000 tons of shell steel have appeared in this market the past two or three days. Most of this is for France. A very heavy tonnage is now pending. A domestic steel foundry interest is reported to have closed for 20,000 to 30,000 tons of steel forgings for large shells.

A Connecticut company has placed 10,000 tons of girder and tee rails with two eastern mills.

Ask Relief

Iron and Steel Manufacturers Appeal to the Railroads

Central western manufacturers of iron and steel products, seriously affected by the shortage of cars, have appealed to officials of railroads, serving eastern and central western territory, in a concerted effort to obtain definite relief. An acute shortage of coal, coke and iron ore may exist in the central west, it is pointed out, unless more railroad cars soon are available.

A committee representing a number of steel works, blast furnace and iron ore interests called upon officials of several railroads last week, to learn if it would not be possible to release cars blocked in eastern territory for central western trade. Numerous plans were suggested, but nothing definite was accomplished.

Another conference between committees representing the railroads and shippers will be held at an early date.

H. F. Black has been appointed assistant to the president of the Midvale Steel Co., the Cambria Steel Co. and Worth Bros. Co., with offices in the Oliver building, Pittsburgh. Mr. Black will have complete charge of all matters pertaining to ore, coal, coke, limestone, manganese, pig iron, scrap and other similar raw materials.

J. C. Meloon's fiftieth anniversary of his services with the General Fire Extinguisher Co., Providence, R. I., was observed with a dinner at the Turks Head club, that city, the night of April 13, at which he was the recipient of a solid silver tea and coffee service from his business associates and $250, in gold from the company.

Making Iron Segments for Tunnels

THE CONSTRUCTION of sub-aqueous tunnels in and about New York has been carried on so rapidly that the few foundries engaged in making the cast segments for the tubes are taxed to capacity. This article describes the methods by which one company successfully maintains a high rate of production

BY E. C. KREUTZBERG

THE manufacture of gray iron castings for use in the construction of modern tunnels has developed during the last decade into an exceedingly important branch of the foundry industry. During that time several hundred thousand tons of pig iron have been converted into tunnel castings and, owing to the remarkable manner in which these sub-aqueous highways have filled the need for rapid transit facilities between New York and the surrounding territory, it is to be expected that the demand for such castings in the future will keep pace with the requirements of congested centers of population where waterways are an obstruction to traffic. A sub-aqueous tunnel driven by the shield method, although its construction calls for engineering ability of the highest order and the working out of a tremendous amount of detail, may be described briefly as a cast iron tube, encased in a grouting of cement and lined with concrete. The tunnel is constructed along a path opened by a steel shield; the latter is advanced by hydraulic jacks and is provided with a door through which workmen pass the dirt which they remove from in front of the shield. These men work under a hood, and in atmosphere which is maintained under pressure to reduce to a minimum the leakage from the river bed above. The cast iron tube is built up of rings which have a length of about 2 feet along the axis of the tunnel, and a diameter which generally varies from 17 to 20 feet, depending on the size of the tunnel. The rings, in order that they may be handled with facility, are built-up of segments, of which there generally are 9 to 11 to a ring, depending on the diameter. The segments are provided with holes through which the casing of cement grouting may be applied from the interior of the tunnel, and with flanges for bolting them together, the joints being calked. After the tube is completed, the tunnel is equipped with tracks or pipes according to the purpose for which is was designed.

The primary requirements of a foundry engaging in the manufacture of tunnel castings are a large molding floor area and a corresponding melting capacity, since the molds are of good size and the castings are heavy and thousands of them are needed to keep abreast of the requirements of rapid tunnel construction.

Although the methods of molding are simple, numerous flasks and other special equipment are needed, while for machining the segments much special machinery of unusually large size and capacity must be installed. In fact, such work calls for specializing by the foundry participating in it to a degree unusual in jobbing work. As a result, only a few concerns have engaged in the manufacture of cast iron tunnel segments. Among them is the Davies & Thomas Co., Catasauqua, Pa., one of the first concerns to embark in the manufacture of such castings, and manufacturer of the greater portion of the cast iron tonnage embodied in the sub-aqueous tunnels under New York harbor. At the present time, this company has two uncompleted contracts for tunnel segments, one involving 18,000 and the other 22,000 tons, of which approximately 30,000 tons still are to be produced. The routine worked out at this plant in the manufacture of these castings is of interest to every foundryman.

FIG. 1—DIRECT-DRAW, ROLL-OVER, JOLT MACHINE USED FOR MAKING DRAGS OF TUNNEL SEGMENT MOLDS

At the present time the Davies & Thomas Co. is devoting 14 molding floors to tunnel segment castings, each floor producing 12 to 14 seg-

FIG. 2—TUNNEL SEGMENT PATTERN AND FOLLOW-BOARD AND DRAG SECTION OF FLASK

FIG. 3.—COPE MOLDING MACHINE FOR TUNNEL SEGMENT CASTINGS

FIG. 4—COMPLETED COPE AND DRAG, SHOWING TYPE OF CORES USED FOR PROVIDING BOLT-HOLES

FIG. 5—MACHINING SIDES OF SEGMENT CASTINGS ON LARGE MILLING MACHINE

ments a day, resulting in a daily output of approximately 125 tons. Plans now are being prepared to increase the output and it is expected that by Sept. 1 the production will be about 175 tons per day. The molding methods employed are principally of the well-known floor type, as illustrated in Figs. 2 and 4. The pattern, shown in Fig. 2 is of simple construction and is mounted on an ordinary wood follow-board. The flasks are cast iron and are provided with trunnions which admit of convenient handling by the hoists which serve each floor. The bottom of the cope is convex and the top of the drag concave, thus providing a joint which conforms to the contour of the pattern; the mold is located entirely in the drag, the cope serving simply as a cover. The casting is poured through two gates, located at one end of the flask and the mold is provided with a riser. Figs. 2 and 4 illustrate the sequence of molding operations: The drag is rammed and rolled over, the cope is rammed and lifted, the pattern removed, the cores set in the prints and the mold closed. These castings are made on a piece-work basis, one molder and one or two helpers to a floor, the molders engaging their helpers. Because of the large floor area at the company's command, and the correspondingly great output which it thus has been able to obtain by floor molding methods, it is only within the past few months that it has undertaken the installation of molding machines for use in producing tunnel segment castings. The two machines in use were furnished by the Osborn Mfg. Co., Cleveland. The one shown in Fig. 1 is a direct-draw, roll-over jolt, used in molding the drags, while the cope machine, illustrated in Fig. 3, is of the plain jar-ramming type. Both machines are manipulated by compressed air. The flasks used for machine molding, as shown in Fig. 3, are exactly the same as those used for floor molding. For removing the drags, the roll-over machine is served by a receiving car, from which the drags may be transferred by crane to the pouring floor. The copes, which do not include any portion of the mold and whose function is simply to close the drags, are lifted off the plain jolt machine by a crane which carries them to the pouring floor. Molding sand is supplied to the machine by gravity, flowing into the flasks from an overhead steel reservoir which has capacity for holding 45 tons. The downtakes from the reservoir are provided with gates by which the flow of sand may be regulated from the floor. The supply of sand in the reservoir is replenished constantly by a bucket elevator which is fed from a pit in the foundry floor. The molding machine installation has a capacity for turning out a complete mold every five or six minutes; it has not yet been put in full operation due to the fact that facilities for handling the output of the machines have not been completed. The company is arranging for the addition of a traveling crane and other equipment necessary for this purpose.

For each segment mold 15 dry sand cores are required to form the bolt holes in the flanges, and the tap hole in the face of the casting. These are placed in the molds in prints which are made by removable lugs on the pattern. The bolt hole cores are made in large numbers, the output

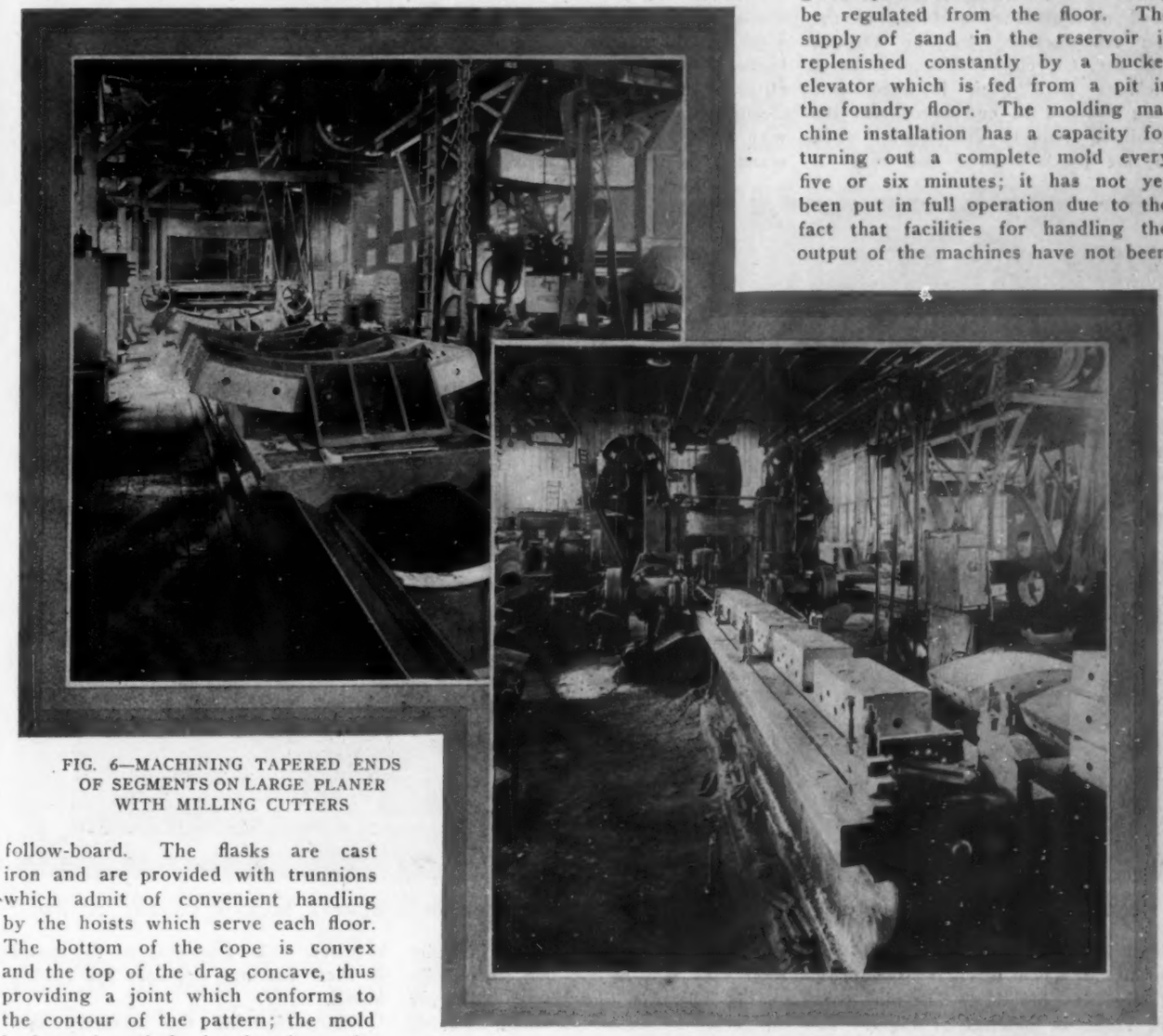

FIG. 6—MACHINING TAPERED ENDS OF SEGMENTS ON LARGE PLANER WITH MILLING CUTTERS

FIG 7—MACHINING KEY SEGMENTS ON A MILLING MACHINE

ranging from three to four tons a day. As shown in Fig. 4, they are of two sizes, the bolt holes at the end of each segment being formed by a single large core, while each of the side bolt holes is formed by a small core. A portion of the output of the large cores is turned out by the usual hand method at a rate of 55 to 60 cores per day per man; the remainder of the end cores and all of the small bolt hole cores are produced on roll-over machines of the type manufactured by the Osborn Mfg. Co., Cleveland. Three of these machines have been installed, one being devoted to end cores and the remaining two to side cores. The machine production of end cores is about 100 per day, while the side core output for each machine is approximately 1,800 per day. The side cores are made in batches of eight. The core department is equipped with three large coal burning ovens and the entire floor space is commanded by a 6-ton traveling crane.

The specifications to which the segments must conform were drawn by the public service commission, first district of the state of New York. These specify the use of No. 2 plain pig iron, and for the usual physical requirements in the resulting castings. The plant is equipped with four cupolas, three of which have capacity for melting 12 tons an hour each, while the fourth has an output of 10 tons an hour. At the present two 12-ton cupolas are operated and the third shortly will be employed. The foundry is provided with a network of narrow-gage industrial track which is utilized for distributing the metal in ladle cars. Approximately 24,000 square feet of foundry floor space is devoted to the segments.

Cleaning the Segments

Between the foundry and machine shops is the cleaning department, 40 x 80 feet. A branch of the industrial railroad which communicates with all parts of the plant extends into the cleaning department and is equipped with three 6-ton overhead traveling cranes. In this department the castings are cleaned superficially in order that they may be handled with facility in the machine shop; they are subjected to a more thorough cleaning and finishing process after they have been machined.

The castings are delivered to the cleaning room as soon as they have been shaken-out, and after cleaning, they are coated with tar while still hot. The castings which cannot be tarred immediately are placed in a pit in which they retain their heat until it is convenient to apply the coating of tar.

The machining of tunnel segment castings is an exacting operation, since any inaccuracies may result in serious deflections in the work of tunnel construction. The segments now being made at the Davies & Thomas plant are designed for assembling into rings, 18 feet in diameter and 26 inches wide, nine segments and one key constituting a ring. Of these segments, seven are provided with joints whose planes pass through the center of the ring. The remaining two have one tapered joint each, thus forming an opening into which the key segment may be inserted from the interior of the ring. The key segments weigh about 400 pounds each, while the weight of the other segments is approximately 1,500 pounds each. The key segments are molded in the same manner as the heavier segments, but the flasks are shorter and not so many cores are required. The thickness of the metal in these castings averages 1¼ to 1⅝ inches.

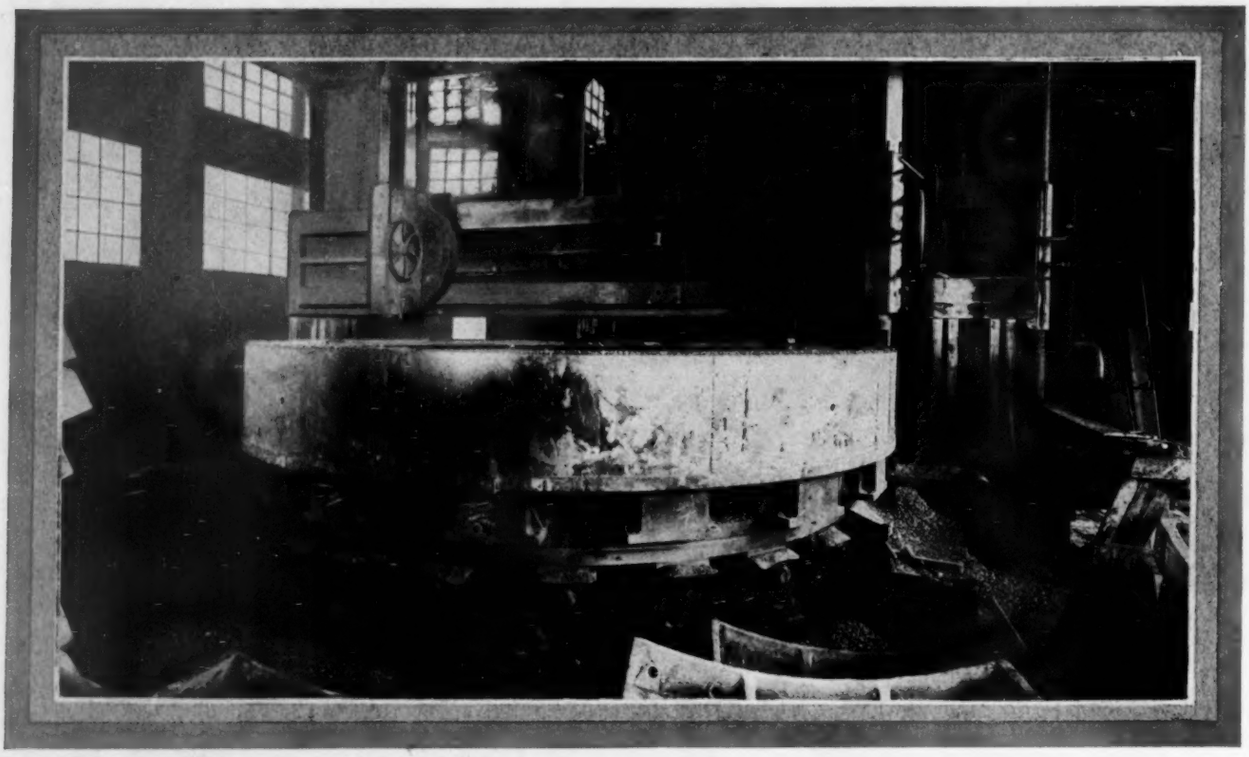

FIG. 8—MACHINING A ¾-INCH TAPER ON A RING WHICH IS TO BE USED IN A CURVED SECTION OF THE TUNNEL

For performing the necessary machine shop operations, the Davies & Thomas Co. has installed heavy machinery which is located in two buildings, 55 x 160 and 55 x 110 feet, respectively. For machining the sides, the heavier segments are placed two-high, on two 42-foot Ingersoll milling machines. Each of these machines is driven by a 50-horsepower, direct-connected motor and is provided with two tables, one of which may be loaded while the castings on the other are being chucked. The machines, known as hoggers, mill both sides of the segments simultaneously, completing two

segments every 15 to 20 minutes. As shown in Fig. 5, the segments are held in a chuck, patented by the Davies & Thomas Co., which was designed especially for this work.

Machining the Tapered Ends

For machining the tapered ends, the segments are placed on planers which are provided with two milling heads each so that both ends may be machined simultaneously. Three planers are engaged in this work, each of which has a length of 62 feet in the shears. These planers have two tables each, thus permitting one to be loaded while the other is under the milling cutters. A special method of driving, involving the use of a wheel and disc friction and a worm gear, has been applied to these planers in order that the feed of the tools may be adjusted to keep pace with the capacity of the milling cutters as well as to permit rapid forward and return movements when desired. Each planer table has a capacity for holding six to eight segments and the operating time for milling the ends averages about one hour per table. In addition, a 95-foot planer, shown in Fig. 6, like the 42-foot milling machines, is devoted to the milling of sides. This planer also is provided with two tables, each of which has a capacity for six segments, the machining time per table being about one hour. It is equipped with the same special drive which has been applied to the planers engaged in milling ends. For milling the key segments, a third Ingersoll milling machine, shown in Fig. 7, is employed. This is equipped for milling both the ends and sides of the key segments. For milling the ends, the table has a capacity of seven segments, while for milling the sides, the capacity is five.

Rings which are intended for use in curved sections of tunnels are assembled and machined on a boring mill which has a 19-foot table, but which can take work 25 feet in diameter. The rings are held in a chuck which elevates one side, usually about ¾-inch, above the level of the other, so that after the two sides have been machined, they converge slightly, instead of being parallel to each other as in the case of rings designed for straight sections of the tunnel.

Machine Shop Equipment

A view of the boring mill in operation is shown in Fig. 8. Only one side of the ring is tapered on the boring mill, the other sides of the segments forming the ring being machined separately on milling machines. The boring mill is served by a 6-ton traveling crane. Each milling machine and planer is commanded by a 3-ton traveling crane. The machine shop is equipped with two Ingersoll milling cutter grinders which are constantly operated, due to the severe service to which the milling cutters, both on the planers and milling machines, are subjected. In addition to the foregoing equipment, which is used exclusively for work on tunnel castings, the company operates a large machine shop, 50 x 150 feet, devoted to general jobbing work.

Inspecting the Segments

Fig. 9 shows the finishing, inspection and shipping department, which is 30 x 150 feet and is commanded by a 15-ton overhead traveling crane. Here all burrs and imperfections are removed, the bolt holes are drifted to remove obstructions, and the holes in the surfaces of the segments, which are to be used in encasing the tunnel in a grouting of cement, are reamed and tapped, all of these operations being performed by pneumatic tools. The inspection of the castings is in charge of a representative of the public service commission of the first district of the state of New York. He examines the castings for all possible flaws, employing templates to test the accuracy of the joints and the spacing of the bolt holes.

In addition to operating what is one of the largest jobbing foundries in the country, with a capacity for

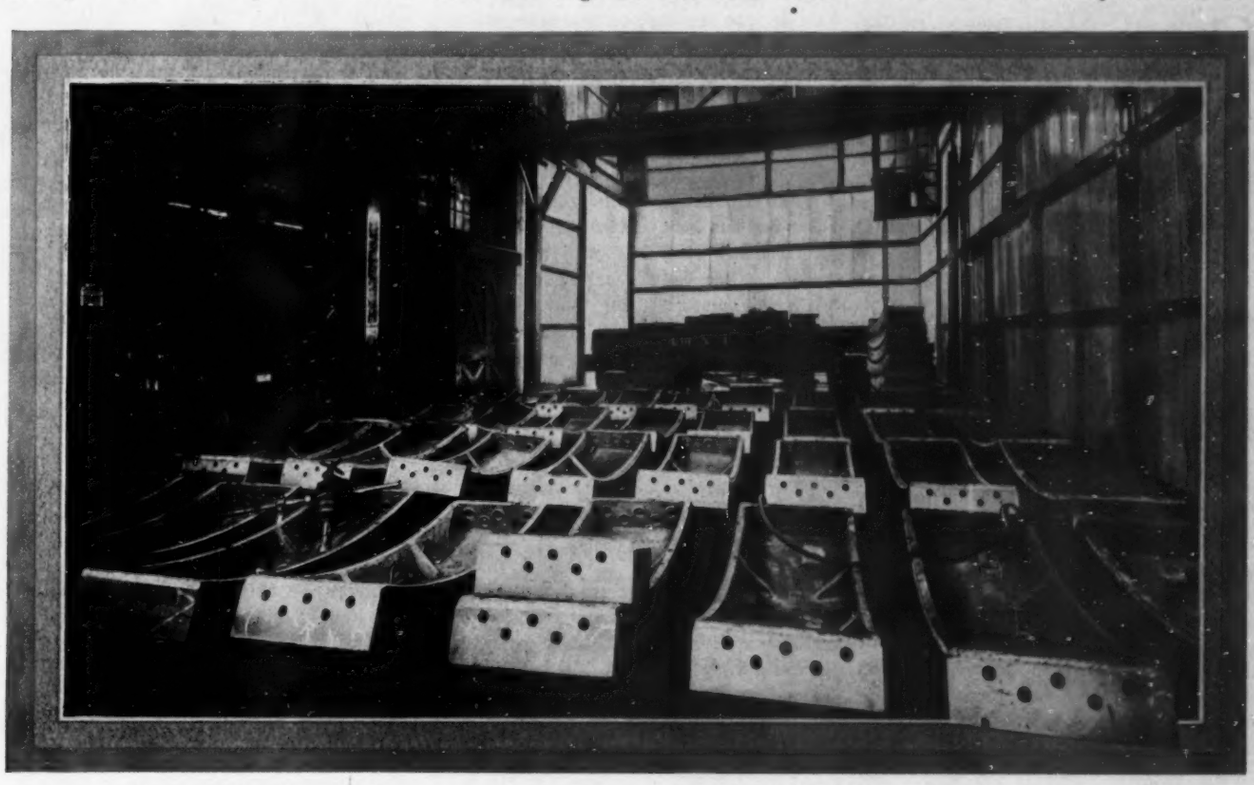

FIG. 9—SHIPPING DEPARTMENT, WHERE CASTINGS ARE FINISHED AND INSPECTED PRIOR TO LOADING THEM ON CARS

melting 250 tons of gray iron daily, the Davies & Thomas Co. enjoys the distinction of having supplied the major portion of the cast iron linings for sub-aqueous tunnels driven by the shield method of this country

Has Large Contracts

The contracts on which it now is working involve 18,000 tons of segments for the Rapid Transit railroad tunnel, which is under construction from Old Slip, East river, Manhattan, to Clark street to Fulton street, Brooklyn, and 22,000 tons for the Eastern Rapid Transit railroad tunnel from Fourteenth street, East river, Manhattan, to Bedford avenue, Brooklyn. The segments on the two contracts are identical in size and weight. On the first contract, approximately 10,000 tons have been delivered, leaving 30,000 tons to be produced on the two contracts. The following is a list of the tunnel segment contracts booked by the Davies & Thomas Co. since it began the manufacture of this kind of work in 1905:

	Tons
Pennsylvania tunnel	57,340
East River tunnel	20,525
Hudson & Manhattan Railroad tunnel	13,312
Steinway tunnel	13,794
Harlem River tunnel	2,165
East River Gas tunnel	2,000
Roof tunnel over the New York Central railroad tracks	838
Sewer tunnel, Borough of Queens, Brooklyn, N. Y.	11,000
Philadelphia Electric In-Take tunnel	2,000
Rapid Transit railroad tunnel	18,000
Rapid Transit railroad, 14th street tunnel	22,000
Total	162,974

Recovery of Benzol from Coke Oven Gas

C. G. ATWATER, manager of the agricultural department of the Barrett Co., New York, recently read an interesting paper on "The Utilization of By-Products from the Manufacture of Coke," before the Engineers' Society of Western Pennsylvania. He said that the distillation of coal is practiced in three general types of apparatus, namely, the coal gas retort, the beehive coke oven and the by-product coke oven. He briefly discussed the manufacture of coke for use in the blast furnace and the cupola.

Mr. Atwater outlined in detail the recovery of ammonia, gas, benzol, cyanides, tar and heavy oil. Referring to the recovery of benzol from coke oven gas, he said:

"Coke oven gas is the main source of all the benzol produced, although coal tar is usually credited with containing the benzol, which forms the foundation of so large a portion of the coal tar chemical industry. This is also true of the products allied to benzol, such as toluol and xylol. Crude benzol, as obtained by washing this coke oven gas, is in reality a mixture consisting principally of these three. The process of recovering the benzol consists in washing the gas with a heavy oil, usually derived from coal tar, or from petroleum until this oil is charged with the crude benzol, when it is removed from the circulating system and distilled at such a temperature as to drive over the benzol and allied vapors without disturbing the original washing oil. This oil may then be cooled and returned to the circulating system. The type of washer used for this purpose does not differ in any essential particular from that used in washing the gas with water to obtain the ammonia, the principle being to expose as large a surface of the washing oil as possible to the gas to facilitate absorption. The quantity of crude benzol contained in gas varies from two gallons per ton of coal carbonized to very much less than this, according to the volatile matter in the coal. The subsequent treatment of the crude benzol to separate it into its various fractions is carried out by fractional distillation between limited temperatures. Ninety per cent benzol, which is the usual commercial standard, is that product, 90 per cent of which will distill over at 100 degrees Cent. or lower.

"The production of benzol from coke oven gas has been extensively carried on in Germany and the large amounts of benzol so secured have been one of the main raw materials for their highly developed coal tar chemical industry. The surplus benzol was used as a motor fuel in place of gasoline, and under the present war conditions, benzol is the principal fuel for automobiles and similar engines.

"Pure benzol is also the starting point for the manufacture of aniline oil and a wide range of dyestuffs based on it. It is also important at present because from it pure phenol or carbolic acid can be synthetically produced. There is a great scarcity of phenol at present, as it is extensively used for making tri-nitro phenol or picric acid, an explosive; also for the peaceful use of making phonographic records.

"The separation of the toluol from the crude benzol also supplies material for making tri-nitro toluol, a very important explosive used by the armies and navies of most nations in their shells, torpedoes, mines, etc.

"The amount of benzol produced in the United States was very small until subsequent to the outbreak of the European war. If all the coal made into coke had been treated for benzol recovery, we would have had a production of about 100,000,000 gallons per year, on the moderate estimate of 1½ gallons per ton of coal. It is stated on good authority, however, that the total recovery in 1913 was not more than 4,500,000 gallons, outside of that used for gas enrichment by the producer. The European war, however, not only cut us off from our foreign supplies of chemical and dyestuffs based on benzol, but immensely increased the demand for it because of the manufacture of war munitions in this country. Accordingly many benzol recovery plants have sprung into being, and this article hitherto, if not actually wasted, at least lavished on uses far below its potential value, is now in a fair way to come into its own. The geological survey in a recent report, states that the output of benzol and light oils in 1915 was nearly 14,000,000 gallons and that with the completion of the new plants under construction, the capacity will probably exceed 22,000,000 gallons per year. The price for refined benzol has risen from 20 cents per gallon to 60 cents or over, and toluol, formerly in limited demand at 25 cents per gallon, has risen to $4.25 per gallon, and upwards.

"As benzol is an excellent motor fuel, it is quite probable that any surplus existing after the close of the war can be readily absorbed for this purpose, although we may well hope that the development of our chemical industries will afford an adequate and more remunerative market."

In a 32-page catalog recently published by the Trussed Concrete Steel Co., Pittsburgh, portable steel buildings are described and illustrated. It is claimed that these buildings are of especially substantial and enduring construction. The catalog describes portable structures, including garages, contractors' houses, hospital, school and factory buildings, summer cottages, boat houses and election booths. The illustrations show types of these buildings in actual use, as well as methods of erection and list of materials needed.

The Electric Controller & Mfg. Co., Cleveland, has issued a 19-page reprint of a paper on "Mill Controllers", read by H. F. Stratton at the Pittsburgh meeting of the American Institute of Electrical Engineers, April 15, 1915. The reprint is attractively arranged and is enclosed in a cover bearing an etching of a blooming mill in operation.

Proper Care of Cranes and Hoists

GOOD DESIGN and careful construction of cranes and hoists facilitates safe and economical operation. In this article the author points out the requisites of properly constructed cranes and outlines in considerable detail the precautions necessary in maintaining and operating this kind of shop equipment

BY H. A. SHULTZ

TRUSTWORTHY men only should be placed in charge of hoisting or conveying machinery. They should be made to follow hard and fast rules which, by experience, have proven the most reliable in the prevention of accidents. Men in charge of such equipment, and especially those who are handling hot metal or material equally dangerous, must have a clear mind and be steady and alert at all times. Some concerns require a rigid examination and a complete record of all such operators.

Better Class of Employes

Industrial concerns should not treat the subject of employes for this class of work lightly, as it is one of the most important. Wages should be on such a scale as to be attractive to the better class; in fact, men should be selected from the electrical or mechanical departments who have complete knowledge of such machinery and its operation. The position should be one of promotion rather than demotion, as is the practice in the majority of cases.

In small factories or departments, where such equipment is used only a few minutes each day and the expense of a regular operator is not warranted, at least two of the most intelligent men in the department should be chosen and trained thoroughly. If neither of these men is on duty, an experienced man should be summoned from the electrical or mechanical department; a man with slight experience should never be allowed to operate any kind of hoisting and conveying machinery.

As an example, in one shop a regular operator was instructing a man for one of the hot metal cranes in an open hearth department. Everything had been working nicely for some time, and not realizing the danger, he allowed the new man to lift and handle a ladle of hot metal. He was successful until he started to lower, when he became confused in the controllers and instead of trying to ascertain the trouble, immediately jumped out of the cab and made his escape. The ladle, in the meantime, came down and turned over on the pouring floor, endangering the lives of all working in its vicinity. Luckily no one was injured.

Overhead traveling cranes should be installed with every convenience for the operator, inspector or repairman. This should include a complete set of runways and platforms by which all parts of the crane can be reached. The manner of reaching these over-head runways or platforms from the ground should preferably be by means of a stairway, but where this is impossible, the only other convenient means is by a permanent or fixed ladder. In order to lessen the danger of the operator falling when going up to or down from his work, any straight permanent ladders should be provided with a safety cage, about 27 inches inside diameter.

Stairways and Platforms

On a complete installation, the runway walk on the cab side should extend the entire length of the runway, so that the operator or any one who has work to do on the crane can enter or leave it safely when in any position. There should be a stairway at each end of this runway, and on long runways it is best to have one at the center. On the opposite side from that on which the cab is located, there should be a platform extending 15 or 20 feet along the runway for repairing the bridge wheels or making other repairs to this end of the crane. If there are two cranes on the same runway, there should be two of these platforms and if a third crane is on the runway, there should be one located in the center. The idea of having a platform for each crane is so that if one crane is down and needs repairs, it will not tie up the others. Access to these latter platforms can be obtained by passing over the bridge walk on the crane and it will not be necessary to provide separate means for reaching these platforms from the ground.

Over-head traveling cranes should be of all steel construction. No cast iron should be used except for minor parts, such as drums, bearing brackets, caps, boxes, etc., where strength is not of primary importance. No wood or other combustible material should be used in the construction of cranes. All bolts used should be of the through type, and

Rules for Safety

Rules pertaining to the safe operation of cranes should be posted in the cage and strictly followed by the operators. A few suggestions for such rules are as follows:

No one but a regular authorized operator is allowed to use any crane.

When on duty, remain in crane cage ready for prompt service.

Never go to top of crane or permit any one else to do so without opening switch and placing warning sign or lock on it; when you find this signal on switch, do not close same until you are absolutely sure there is no one who might be caught on crane or crane runway.

Before racking carriage or moving crane bridge, be sure that hook is high enough to clear all obstacles.

Under no consideration permit your crane to bump into another crane until you are positive that no one on the other crane is in a position to be injured.

Examine your crane every turn for loose or defective gears, keys, runways, railings, warning bells, signs, switches, sweepbrushes, cables, etc., and report any defects found. Keep crane clean and well lubricated.

When crane is down for repairs, assist repairman. After completion of any job, make sure that bolts, tools, etc., have been removed so that no damage to machinery will result when crane is started, and so that nothing can fall off crane. Keep tools, oil cans, and other loose objects in box provided for that purpose.

Do not carry load over men on floor; using warning gong to attract their attention.

Do not allow men to ride on load carried by crane, or on crane hooks.

Do not move load without signal from proper man.

When handling heavy loads, particularly hot metal, test hoist brake by throwing controller to "off" position after load has been lifted a few inches; if brake does not hold load, do not move crane until it has been repaired or adjusted.

Do not carry objects up and down ladder; use rope for handling anything too large to go into pocket.

When leaving cage always open main switch.

Presented at a recent meeting of the Pennsylvania Industrial Welfare and Efficiency Conference. The author, H. A. Shultz, is associated with the American Steel & Wire Co., Pittsburgh.

no studs or cap screws should be used, unless by special agreement; bolts should be suitably secured from turning, and equipped with approved lock nuts or lock washers.

For cranes with a capacity of five tons or under, bridge track wheels should be not less than 18-inch diameter; for capacities of over five tons, they should be not less than 24-inch diameter. Trolley wheels should not be less than 12-inch diameter. All track wheels should preferably be either of rolled open hearth steel, 0.70 or 0.80 carbon, or of cast iron or steel bodies, equipped with rolled steel tires shrunk on The wheels should be accurately finished for diameter and tread required, and the tread should be of sufficient thickness to carry the rated load when wheels have been reduced 1¼ inches in diameter.

The crane should be well supplied with foot walks, which should be located the entire length of the crane girders, either on one or both sides, as the conditions may require; also across either one or both ends of the trolley, at right angles to the bridge walks, from which the crane mechanism can be easily reached. Where there is only one walk along the bridge girder, there should be a walk across the side of the trolley opposite. If the bridge is provided with two walks, one on either side, this will serve the same purpose and it would not be necessary to install a walk on the three sides of the trolley.

Construction of Walks

All walks should be of substantial steel construction and rigidly braced so as to eliminate vibration. The width of the main walks should preferably be not less than 30 inches from the outer edge to the web of the girder; the width of the trolley walks should be not less than 15 inches. The floor of these walks should be made of checkered steel plate, not less than ¼-inch thick, which should extend from the outside of the toe board to the bridge girder and be fitted neatly where irregularities occur, so as to leave no openings through which material or tools may fall. The railing should be of riveted structural steel construction, with two horizontal members, not less than 3 feet 3 inches high and toe boards at least 4 inches in net height should be provided.

Wherever possible, all walks should be so arranged that there will be sufficient head clearance between the floor of walk and overhead trusses or other structural members. There should be a clearance of at least 18 inches between the railing of the bridge walk and the trolley. The operator's cage should be securely fastened to bridge girders and should be well braced to minimize vibration. This cage should be large enough to allow ample room for equipment and operator, and should be enclosed to a height of 3 feet 3 inches from the floor with sheet steel or woven steel fabric. If this is not so enclosed, and only guarded by railings, a standard toe board not less than 4 inches in height should be placed around the exposed edges.

Protection for Operator

A safe and convenient arrangement should be made to allow the operator to pass from the cage to foot walks and bridge girders. This should preferably be in the form of a stairway, leading from the inside of the cage or a permanent protected platform just outside; but where this is impossible a ladder can be used, which should also lead from the inside or a protected portion of the cage, so there will be no danger of the operator falling to the ground when using it.

Factors of Safety for Design of Cranes

The construction and workmanship of the crane itself should be first-class in every respect, and designed with the following factors of safety based on the intimate strength of the materials used when under full rated load stresses:

Parts subject to dynamic strains, such as gear shafts, drum shafts, gears, hooks, blocks, etc., not less than 10.

Hoisting cables not less than 8.

Girders and other parts subject to static strains, not less than 5.

For journals and axles, the dimensions should be increased until the bearing pressure and deflection come within safe and durable limits.

For cranes handling hot metal and other extra hazardous service, the factor of safety given above for hoisting rope should be increased at least 25 per cent.

Calculations for wind pressure on outside cranes should be based on not less than 30 pounds per square foot of exposed surface.

Ladle and other cranes subjected to heat from below should have a ⅛-inch sheet steel shield 6 inches below the bottom of the cage floor. As additional protection to the operator in case of an electrical fire, the cage should be equipped with an approved extinguisher filled with non-conducting fluid.

All parts of the crane should be readily accessible and so designed that it will not be necessary to remove any keyed parts, or to disturb any other shafting in order to change any shafting on the crane. The hoisting shafting, carrying gears, pinions, drums or sheaves should be of forged open hearth steel. The net required section should be increased in diameter by not less than twice the depth of the key seat, and the over-all shaft diameter should be in even eighths of an inch. All connections subject to torsion should be pressed or shrunk on and keyed in place and press fits should be made with a pressure not less than nine tons per inch diameter. Shafting and couplings should be entirely enclosed and covers so designed that they are readily detachable, and supported in such a manner that they do not revolve with the shafting.

All gears should be enclosed with oil and dust proof covers, conveniently arranged for inspection and lubrication, and strong enough to retain the whole gear or any parts which might break or fall. Keys for gears should be secured in some approved manner to prevent the possibility of working loose. Unprotected keys should not be left projecting on ends of shafts, but should be covered or otherwise protected. Overhung gears should be eliminated wherever possible and no split gears should be used.

The installation of the switch board, wiring and all other electrical equipment should comply fully with the requirements of the national board of fire underwriters. With the exception of trolley conductors, all apparatus carrying electric current must be thoroughly insulated, enclosed or guarded in such a manner that there will be no danger of accidental contact with live parts.

Trolley Conductors

Trolley conductors should preferably be of soft steel bars, or other suitable rolled steel sections, with tinned joints and good mechanical supports. They should be located outside and above the bridge girder, on the side opposite the bridge motor in convenient relation to the foot walk. Under no consideration should their location be such that they may be brought into accidental contact with the hoisting cable. The bridge conductors should be located along the runway girders opposite the crane cab, so as to eliminate the danger of the operator or others coming in contact with live parts when in or entering the crane cage.

Open type controllers should have guards over the movable contact parts, and rheostat and resistance units should be protected from accidental contact or mechanical injury by a suitable enclosure, with adequate provision for ventilation.

The crane switchboard and its equipment should be enclosed in an asbestos lined steel cabinet, with swinging door arranged so that it can be locked, and preferably should be placed in the rear of the cage. The switchboard should include one double pole main line

switch, one double pole magnetically operated circuit breaker, with an individual double pole overload relay and fuse for each motor on the crane. The circuit breaker should be so designed that it will open mechanically if the current supply fails and remain open until closed by the operator. This board should also have two pilot lights.

In addition to the main switch on the crane switchboard, there should be a main line switch mounted above the cage, where it can be conveniently reached from the foot walk. This switch should be so constructed that it can be locked in the open position by repairmen while making any repairs or doing any other work necessary on top of the crane.

The crane hoist should be equipped with an approved system of dynamic braking. The dynamic brake should be supplemented by two magnetic holding brakes of approved type, either of which should be sufficiently powerful to hold the rated load independently under regular operating conditions. One of the holding brakes should be on the armature shaft and the other on the intermediate reduction shaft. Also there should be a foot brake for the bridge travel, of ample capacity to control the crane under full load and at full speed.

The friction brakes should preferably be of the shoe or multiple disc type, so constructed that they will be equally efficient in either direction and enclosed or guarded in such a manner as to eliminate the danger of loose or broken parts falling to the floor.

Each hoist should be provided with an approved limit device, which should preferably be tripped directly from the hoisting block or hook. It is also well to employ dynamic braking in connection with the hoist limit to check the speed of the motor.

Hoists should be equipped with approved steel cables and not chains. Cables should be of plow steel inside and crucible outside, or of all plow steel. For ordinary service, cable with a hemp core can be used, but this should be of soft iron where subject to excessive heat.

The drums should be so designed that there will be not less than two full wraps of hoisting cable in the grooves when the hook is in the lowest position. The pitch diameter of the hoist drums and sheaves should be at least 30 times the diameter of the cable and they should have flanges at each end not less than 1 inch thick and projecting at least 2¾ inches from the body of the drum. The bottom sheaves should be protected by close-fitting guards to prevent the rope from becoming misplaced. The hook block should be of an approved safety type, so arranged that it will lift vertically without twisting. Hooks should be of solid forged steel or laminated steel construction, built up of solid plates and where possible, provided with ball bearings.

Substantial bumpers equipped with springs or other approved form of cushioning device should be provided at the end of the trolley travel. These bumpers should be securely attached to the bridge girder and not to the rail.

Where there is more than one crane on the same runway, suitable bumping blocks should be placed on the end carriages or equalizing trucks at each end of the bridge girder, these also to have springs or other approved cushioning devices. In addition to the bumpers on the cranes, where two or more cranes are on the same runway, there should be temporary bumpers that can be clamped securely to the rails for use, when making repairs. This will prevent other cranes from bumping into the one that is down, and thus eliminate any chance of injury to the repair man.

Heavy lugs or brackets should be placed on trolley frames and end carriages in order to limit the drop to 1 inch or less, if a wheel or axle should break. Trucks should be provided with adequate pads for use with jacks or wedges, when changing track wheels, and the crane should be so designed as to permit changing wheels by simply relieving the bearings of their weight.

For the proctection of workmen underneath, a pan or flooring of steel plate, not less than 3/16-inch thick, should be attached to the trolley frame so as to eliminate danger of objects falling from the trolley to the ground.

Suitable tool boxes of sheet steel construction should be permanently attached at convenient points in the cage or on the crane runway, and these should be large enough to contain the necessary tools, oil cans, etc. The latter should not be left lying about on the crane for fear of jarring off and injuring someone below.

A plate showing the rated capacity of each hoist in pounds should be placed on a girder in such a manner as to be clearly legible from the floor.

On all other types of hoisting and conveying machinery the same degree of safety should be followed as on the larger units, and materials, factors of safety and construction should be chosen to suit conditions.

Conveyors of all types should be fully protected with the necessary guards and devices to make their operation safe in every respect. They should be provided with locking devices so that when making repairs, the repair man may be assured of his safety by inserting his lock and keeping the key in his possession. Operators or repair men working around any equipment of this type should be especially instructed and provided with all the necessities to do their work in absolute safety.

Book Review

The Metallography of Steel and Cast Iron, by Henry M. Howe, LL. D., professor emeritus of metallurgy, Columbia University; 641 pages, 7 x 10½ inches, with numerous diagrams, illustrations, and 45 microphotographic plates; cloth; published by the McGraw-Hill Book Co. and furnished by *The Iron Trade Review*, for $10.00 net.

It is difficult in the limits of a brief review to more than touch upon the many interesting features of this remarkable volume. Written by one of our most eminent metallurgists and representing the fruits of a long and active scientific career, the book may be said to embody the last word on the metallography of steel and cast iron. It is the first of a series of volumes in which the author expects to cover the metallurgy of steel thoroughly.

The volume consists of two distinct parts, an introduction to the new science of miscroscopic metallography as applied to steel and cast iron, and an extended study of a very new branch of that science, namely the mechanism of plastic deformation. In the preface Dr. Howe points out that, "the usefulness of steel really results from its resistance to deformation and its power to endure limited plastic deformation. Hence a knowledge of the mechanism of this deformation and of the way in which steel in part resists deformation and in part accommodates itself to it, may in time disclose the essence of its power of resistance and accommodation. To understand this essence is to be the better prepared to approach the problem of fitting the metal for service, not empirically alone, but also scientifically."

A considerable portion of the volume is devoted to the metallography of cast iron, because in the opinion of the author the study of metallography seems to hold out even greater promises to the iron founder than to the steel maker. Dr. Howe states that he has strong reason to hope that the intelligent application of metallography may succeed in improving the properties of cast iron to such a degree as to broaden its application greatly.

One of the early chapters presents an exhaustive and complete discussion of the many mooted questions surrounding the classification and nomenclature of ferrous products. Various tables of classification and nomenclature are presented, among which a table giving the corresponding terms for the chief classes of iron and steel in eight languages will be found particularly useful.

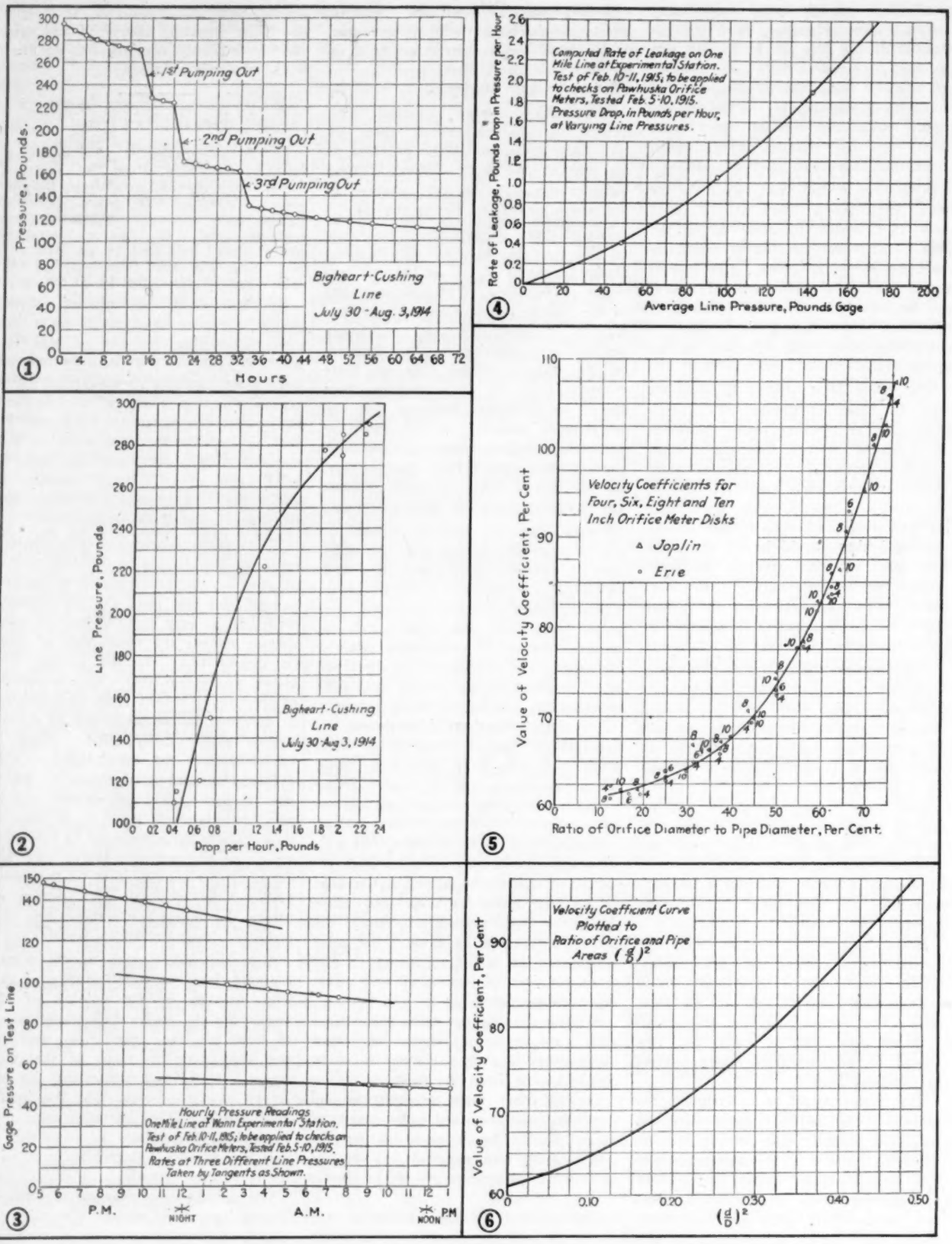
Pressure, Pounds.
1st Pumping Out
2nd Pumping Out
3rd Pumping Out
Bigheart-Cushing Line
July 30 - Aug. 3, 1914
Hours
1
Rate of Leakage, Pounds Drop in Pressure per Hour
Computed Rate of Leakage on One Mile Line at Experimental Station. Test of Feb. 10-11, 1915, to be applied to checks on Pawhuska Orifice Meters, Tested Feb. 5-10, 1915. Pressure Drop, in Pounds per Hour, at Varying Line Pressures.
Average Line Pressure, Pounds Gage
4
Line Pressure, Pounds
Bigheart-Cushing Line
July 30-Aug 3, 1914
Drop per Hour, Pounds
2
Value of Velocity Coefficient, Per Cent
Velocity Coefficients for Four, Six, Eight and Ten Inch Orifice Meter Disks
Joplin
Erie
Ratio of Orifice Diameter to Pipe Diameter, Per Cent.
5
Gage Pressure on Test Line
Hourly Pressure Readings
One Mile Line at Wann Experimental Station.
Test of Feb. 10-11, 1915, to be applied to checks on Pawhuska Orifice Meters, Tested Feb. 5-10, 1915.
Rates at Three Different Line Pressures Taken by Tangents as Shown.
P.M.
NIGHT
A.M.
MOON
P.M.
3
Value of Velocity Coefficient, Per Cent
Velocity Coefficient Curve Plotted to Ratio of Orifice and Pipe Areas $(\frac{d}{D})^2$
$(\frac{d}{D})^2$
6

FIG. 1—PRESSURE LOG DURING LEAKAGE TEST OF BIGHEART-CUSHING LINE
FIG. 2—CURVE OF AVERAGE LEAKAGE DERIVED FROM PLOTTED VALUES OF PRESSURE LOG, FIG. 1
FIG. 3—HOURLY READINGS OF PRESSURE IN WANN LEAKAGE TEST
FIG. 4—COMPUTED RATE OF LEAKAGE IN WANN TESTS. THE CURVE IS DERIVED FROM THE READINGS FROM THE PRESSURE LOG, FIG. 3
FIG. 5—VELOCITY COEFFICIENTS FOR ORIFICE METER DISKS BASED ON RATIO OF DIAMETER. THE CURVE IS SUMMATION OF RESULTS OF ALL TESTS
FIG. 6—VELOCITY COEFFICIENTS FOR ORIFICE METER DISCS BASED UPON RATIO OF AREA

Standardizing Measurement of Gas

THE DISCOVERY that losses in large gas distributing systems in excess of 25 per cent are the general rule rather than the exception has intensified the demand for a reliable means of measurement. The article describes the efforts of one company to solve the problem of metering large volumes of natural gas

BY FRANCIS P. FISHER

WHEN natural gas was first introduced for domestic consumption, its sale was based upon a monthly consideration, the consumer using as much gas as he needed. This method eliminated the problem of gas measurement. Some 20 years ago the extravagance of this system led to the installation of meters. Later, the growing consumption of gas in industrial plants emphasized the need for accurate means of measuring large volumes of gas.

To meet this demand meters of three general classes were devised. The proportion meter, although simple and ingenious in principle, was impracticable because of the interference caused by sand, water, frost, etc., in the pipes. The pitot tube was unsatisfactory because of the weakness of the formulas involved. Tubes of polished brass carefully compared with similar standardized tubes and the coefficients determined by experiment, comprised another scheme of measurement which was inadequate on account of its dependence upon personal accuracy and favorable conditions in the pipe line.

Existing Meters Unsatisfactory

In the past few years a number of meters have been suggested. The Thomas electric meter, the so-called orifice meter, the venturi meter and rotary station meter, are types which have been applied to gas measurement with varying success. Gas companies, under these difficulties have avoided the measuring of gas where possible, but the importance of field measurement, involving large financial settlement, has hurried the search for a satisfactory meter. The discovery that from 35 per cent to an extreme of 80 per cent of all the gas entering town distributing systems appears as unaccounted-for in meter sales, and that some pipe line systems have overall losses of 50 per cent of the gas entering the system, has greatly spurred the companies to arrive at a solution of the problem.

Some three years ago the writer became associated with the reorganized management of a natural gas piping system in the mid-continent field, comprising something over 1,200 miles of main lines with corresponding field and distributing plants. In the course of investigations preparatory to outlining a general policy, there was discovered between purchase and sales a loss of gas which seemed wholly unreasonable and the elimination of which would be the shortest and most effective road to early increase of earnings.

Sources of Leakage

The total loss could be made up from leakage of field and main lines, leakage in distribution systems, errors in large capacity and domestic meters, and errors in estimates of unmeasured gas. The first step in eliminating this waste was to provide an accurate gas measurement at strategical points, for segregating the leakage so that the repair work could be made efficient. Manifestly, the first problem was that of large capacity meter installation, and with part of our losses possibly due to meter inaccuracy, the first step was the establishment of a definite standard of accuracy in meters. The work done to establish this standard has been continued by a technical staff for approximately two and one-half years at considerable expense.

In selecting a point of attack, the large capacity measurements were chosen as promising quicker results for a given amount of work. The method chosen for development was the orifice meter, in the belief that the objections to the existing types could be overcome at less cost and more simply than in any of the others. Further consideration was the absence of delicate mechanism, and the simplicity of the formula.

In order to give the work a sound foundation, it was considered necessary to establish a standard of reference entirely independent of existing meter indications, and a 250,000-cubic foot capacity artificial gas holder at Joplin, Mo., was taken as a reference quantity. Some 500 standardized flows were made, covering a period of nearly a year, for establishing a wholly independent and authoritative coefficient which could be relied on in actual service. This work was confined to various sized orifices in 8 and 10-inch pipes, inasmuch as the quantities to be measured first were large and would necessitate such installations.

In the meantime, while these calibrations were being made, the manufacturers of differential recording gages were urged to perfect and deliver recording differential gages having a range of zero to 50-inch water pressure, and operated by an iron float in a mercury U tube. These gages were finally perfected and delivered about the time of the completion of the Joplin tests, and about 20 of the most important installations were made in rapid succession.

With the results of these installations, after the first two months' operation some serious inconsistencies appeared which were attributed to fundamental error of some kind in the principle being employed. We considered it necessary at once to verify the following basic assumptions not previously experimented on:

1. Coefficient determined by experiments with differentials of 4½ inches of water or less, representing velocities of less than 100 feet per minute, are constant with velocities up to 300 feet per minute, represented by differentials up to 50 inches of water, which were utilized in actual service.
2. Coefficients determined at atmospheric pressure are constant and unchanged by static pressures up to 365 pounds absolute.
3. Coefficient determined with air at point of saturation is applicable to natural gas by applying correction for specific gravity.
4. Natural gas is a perfect gas, having pressure and volume relations according to Boyle's law.

Work to Re-establish Constants

The work of verifying these assumptions was undertaken in three ways. The first was by a careful comparison under operating conditions of orifice meter registration with a calibrated compressor displacement. There was available at Bigheart, Okla., a compressor station consisting of three duplex units of about 950 horsepower rating twin tandem gas engines, each driving two double-acting compressor cylinders with poppet valves,

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Presented at the New Orleans meeting of the American Society of Mechanical Engineers, April 14, 1916. The author is general manager of the Wichita Natural Gas Co., Bartlesville, Okla. An abstract of the paper was published in the April 13 issue of *The Iron Trade Review*.

only one engine being used in the test. Fifty miles distant, near the north end of the Cushing field was located a measuring station with a 10-inch orifice meter containing a disk with a 6½-inch opening. The intervening line was made up of various sizes of pipe. The total volumetric capacity, carefully calculated, from actual measurements, was 265,742 cubic feet. The first factor to be determined was the leakage. The line was filled to about 300 pounds and closed in. After the pressure had equalized, the pressures were carefully taken at half hour intervals, until the pressure reached 270 pounds. Then the compressors were started and the pressure was reduced to 230 pounds. After the pressure was equalized again, the pressures were taken as before. In this way the leakage was determined at a number of points, approximately 280, 225, 165, and 115 pounds, giving the same results that would have been obtained by allowing the whole volume of gas to leak out. Fig. 1 gives a graphical representation of the pressure log during the leakage test.

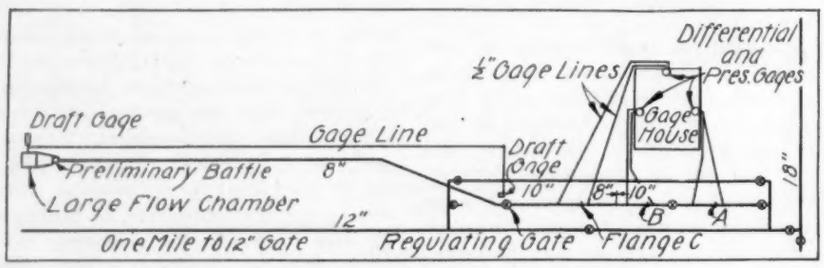


FIG. 7—WANN TESTING STATION CONNECTIONS

Fig. 2 was derived from Fig. 1 by plotting to a large scale and drawing a fair curve through the resulting points to eliminate errors in gage readings. Then the rates of drop at various pressures were plotted. To determine rate leakage at any pressure, multiply line volume by drop in pressure per hour and divide the result by 14.41, which will give the cubic feet of gas leakage per hour.

After determining the leakage, one of the compressor units was carefully overhauled to secure good value and packing ring conditions. An automatic counter equipped with indicating chart was mounted on the secondary shaft with a pressure spring automatically recording the intake pressure of the compresser cylinders, tracing a line on the same chart. The line was filled and shut in at both ends and allowed to equalize. The compressor was started and the intake pressure held constant by regulating a gate on the station intake. Fifteen-minute readings were taken on all gages and thermometers. The total and intermediate numbers of revolutions of the compressor were taken from a revolution counter. The line pressure being taken at the start and finish of the test, the volume of gas taken from the line would equal the initial pressure minus the final pressure divided by 14.41, the result multiplied by the line volume. From this the leakage was deducted, leaving the volume of gas taken by the compressor. With the proper temperature corrections, the volume of gas taken by the compressor divided by the cylinder displacement during test, equals volumetric efficiency. Two reliable tests were made, and the average of the two results was taken as the final figure. The results of two such runs indicated volumetric efficiencies of 82.2 and 83.7 per cent, respectively, averaging 83.0 per cent.

Following this determination gas was drawn through the measuring station, and under test conditions the compressor and meter were operated in tandem for 111 hours, divided into five periods. In the test, all conditions at Bigheart were practically the same as during the volumetric efficiency test. The Cushing end of the line was opened and the line filled until the pressure at Bigheart was above 125 pounds. Then the engine was started, and after running conditions were constant the test was started and continued for five days. Half-hourly readings were taken at both ends of the line. With the exception of the first period, the results were worked up in 24-hour periods. Figures for a typical period showed 613,000 cubic feet gas metered but not compressed and 16,120,000 cubic feet pumped at 14.41 pounds and 82 degrees Fahr., accounting for a total of 16,733,000 cubic feet of gas. Meter calculations gave 17,045,000 cubic feet.

The object of this test is to account for the gas metered by the Cushing meter, using the meter coefficient determined by the Joplin experiments and the recording pressure and differential gages that are in use at the Cushing station. The factors entering into the comparison, for a certain interval of time, are: Quantity of gas metered; quantity lost by leakage; quantity put into or taken out of line by change in line pressure; and quantity taken from line by compressors. The first factor equals the sum of the other three. All gages and thermometers used were calibrated.

The final result of this comparison of the compressor station with the orifice meter shows a constant difference of approximately 2 per cent. Following this test a continuous comparison was carried on by checking monthly totals to secure information as to the consistency of this agreement over a long period of time. For instance, during the month of June, 1915, the amount of gas through the Cushing-Bigheart line compared day by day showed a total compressor station displacement of 377,110,000 cubic feet, using the same volumetric efficiency found by the test. The total orifice meter reading for the same period was 382,480,000, an excess of 1 1/3 per cent. A check of another orifice meter measuring gas through a line consisting of 5.59 miles of 8-inch inside diameter and 9.23 miles of 10-inch inside diameter line gave a flow, by Mr. Weymouth's formula for drop in line pressure, of 333,420,000; and the orifice meter gave totals for the same month of 338,900,000 cubic feet, an excess of 1½ per cent. The pressure in the last two comparisons ranged from 200 to 290 pounds. Leakage allowances were made in each case on the same basis as referred to and shown in Fig. 2 for one of these lines.

Wann Displacement Tests

The pump station and line flow checks gave approximate corroboration in certain specific instances of the value of the coefficient determined at Joplin, but it was admittedly necessary to get a verification covering as wide a range of pressures and differentials as possible. For this purpose we chose a section of line running from Caney, Kan., to a point near Wann, Okla., which was not in use at the time, and was located so that it could be filled with gas at any time up to a pressure of 250 pounds. This line has a calculated capacity of 46,789.67 cubic feet.

There were three gates on the line, so located that the latter could be used as a reservoir having a computed volume of either 46,730, 17,670, or 3,950 cubic feet, according to the size of the meter to be tested. Careful leakage tests were run on the various sections of this line. Figs. 3 and 4 showed the leakage on the smallest division at different line pressures. In making these leakage tests, care was taken to seal the gates at each end of the section in use and drain the line beyond the gate at each end through an observed opening to prevent unknown leakages in, or out, through the gate valves. This station was connected up as shown in the diagram, Fig. 7, so arranged that gas from this reservoir was allowed to escape

through three orifice meter flanges in tandem, one 8-inch and two 10-inch. It was then led through a reducing valve manipulated by an operator, and through a section of line about 300 feet long to a large discharge chamber, Figs. 8 and 9. This chamber consists, as will be seen, of an initial space containing a series of conical baffles to break up eddies in the current, and a second chamber of larger dimensions with an additional baffle having at the outlet end a large flange for conveniently changing the outlet plate. These plates had a central orifice through which gas was discharged to the air by a head in the discharge chamber, maintaining as near an absolute constant as possible for giving a test run. This head was observed at one-minute intervals by a sensitive inclined draft gage, and a second similar draft gage attached to the same line was near the man who regulated the reducing gate. This manipulation was carefully controlled to maintain this head as nearly uniform as possible.

It was the aim to maintain a uniform rate of flow from start to finish of each run, although with a wide variation in pressure and differential on the orifice meters in series. Temperatures were taken at each succeeding point on the line and corresponding corrections made. Nearly 1,200 determinations of coefficients were made. The coefficients range from 0.966 to 1.044 and led to the belief that assumptions Nos. 1 and 2, were not perfect, and that it would be necessary to provide means of using a variable factor instead of a constant heretofore applied on orifice meters.

Question of an Imperfect Gas

Assumption No. 3, that coefficient determined for air would apply for gas, and assumption No. 2, in part, that coefficient determined at low pressure would apply for high static pressure, were called in question in a paper prepared by Professor P. F. Walker. It was therefore deemed necessary to pursue the work suggested by him at that time to conclusion, which could be used as a basis of calculation. In consultation with Professor Walker it was decided to inaugurate simultaneously analogous experiments in the University of Kansas laboratory and at the Wichita Natural Gas Co. laboratory in Bartlesville. Independently and simultaneously, S. S. Wyer, of Columbus, and Robert F. Earhart, working in the laboratories of the Ohio State University, were conducting similar experiments.

A very important factor hitherto unmentioned is that of specific gravity. Gravity determinations in three different fields taken at several months' intervals showed a range of from 0.585 to 0.653;

FIG. 8—OUTFLOW CHAMBER WITH SEPARATE ORIFICE PLATES

0.640 to 0.750; and 0.597 to 0.627, respectively. Simultaneous gravities varied from 0.576 to 0.765. In actual practice, gravity determination of gas at a given purchase meter frequently affects a correction in the monthly settlement of from $3,000 to $8,000, as compared with the gravities taken a month or two previous, or an estimated gravity such as is frequently used. The method of determining this specific gravity with diffusion instruments is rather a delicate manipulation. Even with experienced operators results are liable to vary with the same sample and it is of great commercial importance to eliminate this uncertainty. It was, therefore, considered necessary to develop a type of gravity determining apparatus which would give approximately accurate and consistent results in the hands of inexperienced and unskilled manipulators, so that instruments could be installed at significant points on the piping system and gravities reported at frequent intervals as a matter of routine record; and thus proper correction factors could be applied to the meters in the districts affected. Several types of draft tube and gravity balance were built experimentally to solve this problem, but were rejected. Finally at the suggestion of W. C. Baxter a method

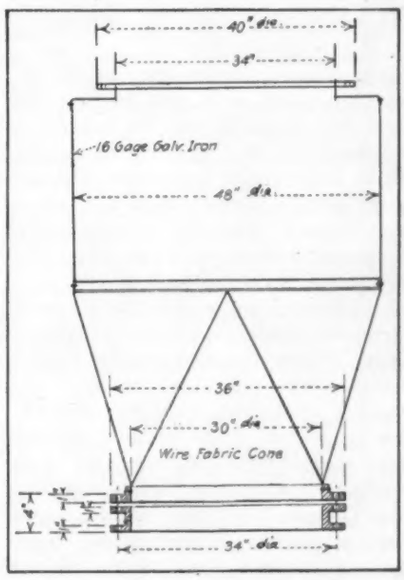


FIG. 9—OUTFLOW CHAMBER WITH SEPARATE ORIFICE PLATES

was proposed using apparatus shown in Fig. 10. The principle involved is simple, consisting of an indicating balance with a beam carrying opposed weights of widely different volume. This balance is enclosed in a chamber with observation glasses at the ends. The balance is adjusted to equilibrium with the chamber filled with air. The air is then completely expelled by a flow of gas and the gas pressure increased in the chamber until the balance is again at equilibrium. The specific gravity is determined by the relative absolute pressure of air and gas necessary to secure the same buoyancy, as shown by indicating balance. The apparatus, even in the crude form shown, seems to be quite sensitive enough to improve materially our gravity records and to involve the personal equation to but a slight degree.

A subsequent series of calibrations was run in 1915 to supplement the large capacity meters previously developed by the addition of a series of relatively small capacity meters in 6-inch and 4-inch pipe. The reference quantity chosen for this work was a small holder located at the testing plant of the Metric Metal Works, Erie, Pa., which was courteously loaned to the company's technical staff for the purpose. Check tests were also taken with 8-inch and 10-inch pipe line orifices; in all about 130 determinations were made covering orifices of various sizes in 4, 6, 8 and 10-inch pipe.

Present Status of Coefficient

All the orifice calibration work, up to and including the Erie tests, has been compiled and reduced to a basis shown in Figs. 5 and 6, showing the velocity coefficient for all sizes of pipe plotted on a basis of the ratio of diameters of orifice to diameters of pipe in Fig. 5, and on the basis of the ratio area of orifice to internal area of pipe opening in Fig. 6. This shows the degree of variation under the conditions of the different tests, and the solid black line is an averaging line on which coefficient for actual use at the present time are based.

It is the belief of the author that this value may be safely applied within the limits of accuracy shown by the curve to any practicable size of pipe line without further question. The number of experiments which are incorporated in it, and the great variety of conditions under which it has been developed, have practically eliminated any personal equation of observational error of any individual test or series of tests.

It was found necessary to develop a differential recording gage to eliminate certain operating difficulties which resulted in loss of record over consider-

able proportion of the time for most of the meters in service. The difficulties to be eliminated were the rupture of spring from overload in spring type gages; erratic calibration in spring type gages; retarding of indicating needle by stuffing box friction in all types; loss of mercury through leakage in mercury float type recording gages, resulting in derangement of zero level of mercury and false reading; loss of mercury through the stuffing box, and the blowing over of mercury into the pipe line with strong flow of gas in the same type of gages.

A type of mercury float gage was suggested by H. O. Ballard, superintendent of lines for this company, and has been gradually developed step by step to overcome the various difficulties enumerated. This gage is so built that when the gas pressure exceeds the range of the gage a free flow of gas is permitted without violently disturbing the body of mercury, so that when the pressure again drops within the limits of the gage the fluid returns to normal registering position and the operation of the gage goes on correctly.

The stuffing box is far from the mercury body, and a large chamber above the mercury with a baffle at the top prevents the splash of the mercury through to the outlet pipe. A small automatic check is inserted in the line, close to the gage, which will allow a gentle flow of gas but shut off with any violent current in either direction by the raising of a light ball to the "choke" position. There is also installed a small mercury separating chamber on the high pressure line to prevent loss of mercury by a back flow.

All large capacity gas meters have maximum capacity limits which must be made sufficient to take the greatest flow to be measured. The minimum limits are not so definite. In all the types enumerated the accuracy deteriorates at the minimum limits. In the orifice meter, the degree of accuracy is apparent on inspection of the chart, for the reason that the resulting percentage of error occasioned by falsely estimating the position of the differential line becomes a much greater factor in the result as the total differential pressure diminishes. In other words, an error which in a 10 or 12-inch differential might be negligible, would be an important factor of a 1-inch differential. As a result, with our 50-inch range recorders, we consider the practical limits of capacity to have a ratio of about one to four.

The more recent phase of the measurement problem shows us that the administration of meters should be treated in the same spirit as the technical problem of developing the apparatus. The meter records are sensitive to the slightest disturbances of operating conditions, and indicate troubles other than measurement and difficulties which would otherwise go unsuspected for some time.

Pulsation of Flow

One problem at present unsolved is obtaining correct measurement with a pulsating flow. This is particularly true where the pulsations are rhythmic, as in the vicinity of compressor stations with reciprocating compressor pistons. An orifice meter early installed at such location failed to check with the station or with meters some 17 miles away on the same line. In endeavoring to locate the difficulty, a series of recording gages was installed, both with and without devices for damping out the pulsations in the lines leading to the gages. There were finally connected in parallel a spring recording gage, a mercury float gage of the type originally installed, a Ballard recording gage and a water U tube. These gages were all calibrated in unison, and agreed very well under condition of steady flow. When the compressor station was started, the gages took widely varying positions; some dropped down to half their former reading despite the increased flow, one took a negative reading as though the flow were reversed and the water column took a wholly indeterminate condition of churned foam; some of the gages moved about in an erratic way and others gave steady indications, but wholly unrelated to the quantity of gas. A proportional meter installed in tandem at this point, gave, over a period of months, a record erratic and irreconcilable as compared with pump station displacement, line flow formula or meters 17 miles away operating on the same gas with steady flow.

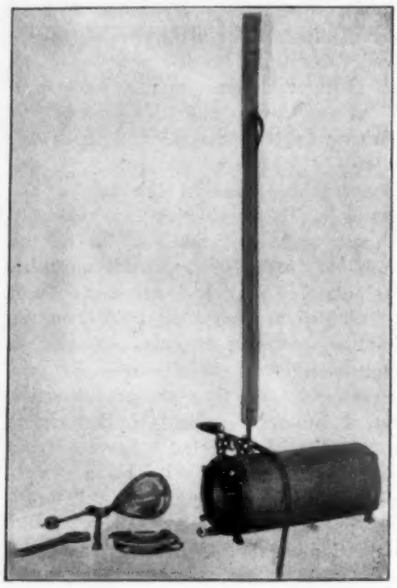
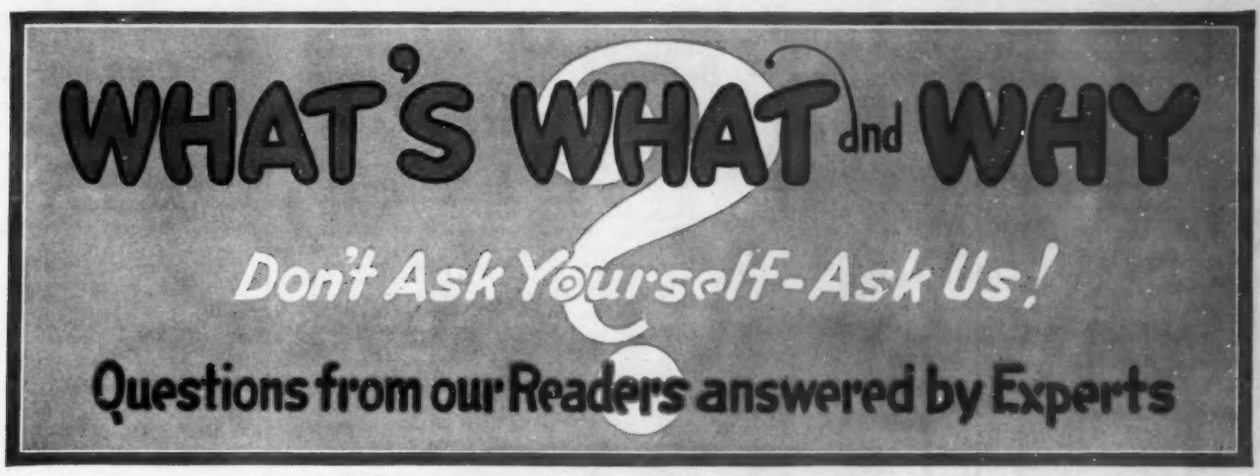


FIG. 10—BAXTER GRAVITY APPARATUS

Similar disturbances in the accuracy of the record are occasioned by irregular pulsations occasioned by the action of fluid in the line. Disturbances are particularly serious when occasioned by irregular or imperfect action of automatic pressure regulators in the vicinity of the meter. After many unsuccessful attempts to solve the problem of measuring under these conditions, our efforts are now bent on eliminating pulsation. One attempt is a device installed ahead of a compressor station with the idea of dividing the gas into about 20 different streams to make each stream traverse a path of different length so that the wave motion from different parts of the cycle would be made to interfere at the point where the gas was again brought to a common line. This is almost successful, and it is believed that by a little further calculation and change of arrangement to secure more perfect interference a measurement at this point may be secured.

The most vital factor, next to technical accuracy, is securing and maintaining the confidence of the "other party to the transaction", in the measurement, especially when obtained by apparatus unfamiliar to him. In the first place, confidence in the accuracy of the gas company's meter measurements in general has not been entirely popular, customary or contagious. Added to that initial handicap is the lack of confidence of the company itself displayed by abandoning a standard method of measurement and adopting a new one. It requires great tact, candor and liberality to develop new confidence from a non-technical public. Our strongest ally has been the fact that it has become generally known that we were working on this problem two years before we actually put it into commercial effect, and many of those with whom we do business realize that the work being done was gone into very carefully. Our next strongest factor is that we have put the same process of measurement simultaneously in use in our purchase and sales meters, and the exact agreement between the constants and apparatus used in purchase and sales meters are open to the inspection and verification of any interested party.



Aluminum Automobile Motors

Is it practical to make automobile engine cylinders entirely out of aluminum at the present time? Would not the intense heat of the explosions in the cylinder prevent the use of aluminum for this purpose?

Within the past few months methods have been worked out by a prominent manufacturer of aluminum castings which have lead to the successful production of aluminum automobile motors. At the present time it is possible to make practically the entire motor of aluminum with the exception of the cylinder head, connecting rod, crankshaft, valves and valve seats. The pistons are aluminum, cast in a permanent iron mold; the cylinder block is cast in sand in the usual manner and has practically the same appearance as an iron cylinder. In some forms of aluminum automobile motors, a cast iron liner is inserted to take the piston wear, although in other types this has been found unnecessary. Up to date it has not been feasible to employ aluminum for the cylinder head, under ordinary circumstances, on account of the fact that this portion of the motor is subjected to the direct heat of the explosion.

Manganese Ore Deposits

I am sending you a small sample of manganese ore taken from land in which I am interested. Will you please have it analyzed and tell us whether you can assist us to get this ore on the market?

There is, of course, a very urgent demand for manganese ore at the present time, but the trouble with nearly all the deposits is that they are not extensive enough to make mining of them profitable. In many parts of the country, it is possible to pick up samples of manganese ore which give a satisfactory analysis, but almost invariably it proves true that the ore is found in small pockets and cannot be profitably mined. For this reason it would do no good to analyze a single sample. The only way in which you can get a person or a company to invest money to develop your property is to have it thoroughly explored and many analyses made, so as to produce absolutely convincing evidence that the mining of ore would be profitable.

Definite Plan to Relieve Freight Congestion

The freight traffic situation seems to be growing worse rather than better. Can you advise me if any definite move has been made to remedy present conditions, and if so, to what extent the persons attempting this relief are vested with authority over shippers and railroads?

The railroads since early in December, 1915, have been trying to relieve the traffic congestion through the work of a car service commission, the members of which have been studying the situation at the affected points. A more effective means of relief has been inaugurated in the forming of a committee invested with unusual powers over the railroads and shippers. This committee is composed of interstate commerce commissioner E. E. Clark, presidents A. H. Smith of the New York Central, Samuel Rea of the Pennsylvania, F. D. Underwood of the Erie, Howard Elliott of the New Haven, W. G. Besler of the Central Railroad of New Jersey, and Daniel Willard of the Baltimore & Ohio. Mr. Smith is chairman.

The committee has full control over embargoes, and temporary charges for track storage, warehouse storage and demurrage. It may direct the operations of the railroads in any manner which will insure a more complete use of their facilities, and may stop shipments to consignees who fail to unload cars promptly.

Steel Corporation Inventory

Does the United States Steel Corporation make an annual inventory of its operating materials, supplies, semi-finished and finished products? If so, will you kindly give us the total of the inventory and the principal items for the years 1914 and 1915? Also can you advise us the amount of coke, manufactured by the United States Steel Corporation in the years 1914 and 1915?

The United States Steel Corporation makes a very careful inventory of its manufacturing and operating materials and supplies, semi-finished and finished products every year, the net book valuation of which was $161,113,900 on Dec. 31, 1915, an increase of $3,022,864 over the total inventory values at the close of the preceding year. The principal items in the inventory dated Dec. 31, 1915, are as follows: Iron ore, $45,532,472; blooms, billets, slabs, sheets and tin plate bars, etc., $11,658,042; finished products, $31,091,145; pig tin, spelter, copper, nickel, aluminum, etc., $7,866,748. The Steel Corporation manufactured 14,500,818 tons of coke in 1915 and 11,173,914 tons in 1914. In 1915, 9,701,692 tons were manufactured in bee hive ovens and 4,799,126 tons in by-product ovens.

Arbitration of Labor Disputes

Was there any important legislation dealing with the arbitration of labor disputes passed during 1915 either by congress or by state legislatures?

Congress passed no legislation dealing with the arbitration of labor disputes during 1915. Several states, however, enacted laws on this subject, the most interesting action being that taken by the legislature of Colorado in connection with the creation of an industrial commission. This

body is required "to do all in its power to promote the voluntary arbitration, mediation and conciliation of disputes between employers and employes, and to avoid the necessity of resorting to strikes, lockouts, blacklists, discriminations, and legal proceedings in matters of employment." Employers and employes are directed to give notice at least 30 days in advance of any intended change affecting conditions of employment with respect to wages and hours. It is made an unlawful act for any employer to declare or cause a lockout, or for any employe to go on strike on account of any dispute prior to or during an investigation, hearing, or arbitration by the commission or an arbitration board appointed by it, and both parties to a dispute are forbidden to make any change in the condition of employment where a dispute has been made the subject of an arbitration, hearing, or investigation by the commission or board until such dispute has been finally dealt with. The finding of the commission or any board of arbitration appointed by it are not binding upon the parties unless they have made a prior agreement in writing to accept and be bound by them, or have agreed to accept and be bound by any rulings made known to them. Findings of the commission are subject to review by the courts on appeal. In Indiana boards may be appointed for the occasion for the adjustment of labor disputes, the governor appointing either on his own motion or on application by either party. The boards have power to compel attendance of witnesses, and may mediate or arbitrate, if an agreement is made to that effect, and are authorized to investigate and publish their findings. In Michigan the state board is to be appointed by the governor, consisting of a commissioner on salary and one other who receives a per diem for services when employed. The act applies to railroads, mines, and public utilities, though other employments may come within the operation of the law on agreement of the parties in interest. If this board is unsuccessful in mediation, four arbitrators are to be chosen, one by the employer, one by the employes, these two to choose the others; if these four fail to reach an agreement, the board may name an umpire.

Iron Master Becomes Master Mariner

THOSE who are accustomed to associate the name of Andrew Carnegie solely with blast furnaces, gigantic combines of industry, public libraries and Skibo Castle, fail to count on the Scotch blood whose call to the sea, sooner or later, every son of Caledonia must reckon with. The Laird has taken up cruising; and enjoys it with the keenest of zest. The accompanying illustrations show Mr. Carnegie as he looks today, ruddy, clear-eyed and hale; and his comfortable craft EVERGLADES, *in which he explores the haunted Southern water forests that give the vessel her name.* EVERGLADES *is a fine example of the modern houseboat-yacht, and is 120 feet long, with a beam of 23 feet, a draft of only 4 feet 6 inches and a gross tonnage of 257. Means of propulsion are provided by a set of Carpenter sails which are frequently invoked on bright days when a snoring breeze wakes the Gulf to a darker blue, as well as two 20th Century gasoline engines. It is said that Mr. Carnegie has made himself familiar with "quarterdeck" routine and with that of the engine-room as well.*

Thermal Expansion

The weights and measures division of the federal bureau of standards has completed designs for an oil bath and for an electric furnace which provide facilities for the determination of coefficients of expansion in the temperature range from about 190 degrees Cent. up to about 700 degrees Cent. The construction of these rather elaborate pieces of apparatus has been completed in the instrument shops of the bureau and will be applied, as time permits, to the determination of the coefficients of expansion of structural steels, the samples to be tested being taken from different parts of the sections of large building columns and girders of known composition and elastic properties. During the latter part of last year the erection of a panel-testing furnace was begun, which will afford the modern facilities for testing the fire-resisting properties of building partitions, the test panel being 12 x 16 feet in area. The equipment provided consists of an oil-burning furnace, with necessary boiler, blower, oil tank, etc., five massive structural steel frames into which the test panels are built, suitable trolleys, crane, structural steel panel rack, etc., to enable the built-in panels to be moved into position before the furnace, fire pump for applying the hose stream from a 1⅛-inch nozzle on the heated partition under test, to simulate fire conditions, etc. This plant, when fully equipped with the seven proposed additional panel frames, will cost about $15,000 and will be the most complete of its kind at present available.

A program of tests is being carried out after consultation with men experienced in the use of these materials. The engineering data resulting from investigations such as those above referred to must serve as the foundation upon which building codes must be constructed. Some progress has been made during the year in compiling the municipal building codes, not alone with a view to furnishing information to state and city building bureaus and to others interested along these lines, but with a view to a comparative study of existing codes to assist in planning a systematic program of investigations to definitely answer the many important questions about which there are still great differences of opinion.

A. S. M. E. Discusses Preparedness

New Orleans Meeting Emphasizes Necessity for Industrial Organization to Back-Up Military Forces—Prominent Men Volunteer Services

AMONG the many far-reaching and perplexing questions thrust into the arena of public discussion by the catclysm in Europe, there are two that are recognized as touching in an extraordinarily vital manner the future industrial and social welfare of this country. It is only natural that these two great problems—the development of our foreign commerce through the instrumentality of an American merchant marine and the perfection of an organization for industrial preparedness—should be closely related. In view of this relationship, it is unusually interesting to observe that the two great conventions that have done the most to pave the way for a practical solution of both of these problems should have been held in New Orleans within the short space of three months. One of these meetings, the National Foreign Trade Conference, took place Jan. 27 and 28; the other, the annual spring meeting of the American Society of Mechanical Engineers, at which the question of industrial preparedness occupied the leading position, concluded its labors on Friday of last week. The enthusiastic and sympathetic reception extended to both of these gatherings in a city which a little over a generation ago was one of the principal seats of the confederacy, is significant of the spirit of the new south in which sectionalism is forgotten and the welfare and interests of the whole country are paramount.

DR. D. S. JACOBUS, PRESIDENT, A. S. M. E., TOOK A FEW SNAPSHOTS

DEAN W. F. M. GOSS INSPECTING DRAINAGE CANAL

Extended Discussion Developed

The recent meeting of the American Society of Mechanical Engineers extended from April 11 to 14, inclusive. The first professional session was held in the ball room of the Grunewald hotel, New Orleans, on Wednesday morning, April 12. The entire period was devoted to a consideration of the great questions surrounding the problem of industrial preparedness, the discussion being initiated by the presentation of a paper entitled "Organizing for Industrial Preparedness," by Spencer Miller, vice president, Lidgerwood Mfg. Co., New York, member of the United States Naval Consulting Board, appointed by the president and members of the council of the American Society of Mechanical Engineers. This paper, which was published in full in the April 13 issue of *The Iron Trade Review*, was read by Charles Whiting Baker, editor, *The Engineering News*, because of the absence of the author.

Aside from its industrial aspects, the resulting discussion, which extended into the Wednesday evening session, marks the permanent affiliation of American engineers, as a body, with the larger political affairs of the country.

As the initial step in industrial preparedness, Mr. Miller's paper advances a scheme for making a complete census of the manufacturing resources and capacity of the country and in the execution of this task the iron, steel and machinery industry, naturally, will take a prominent part. This census will be made under the direction of the committee on production of the Naval Consulting Board. Howard E. Coffin, vice president, Hudson Motor Car Co., Detroit, is chairman of this committee, and local committees, headed by leading manufacturers, many of whom are connected with the iron and steel industry, have been organized in every state in the union.

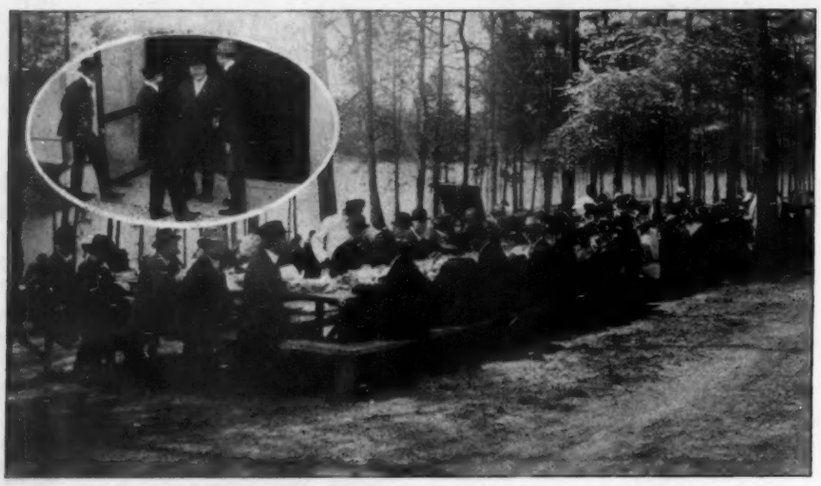
The discussion on industrial preparedness at the New Orleans meeting may be summarized in the words of Frank B. Gilbreth, efficiency en-

FRANK CUTLER, STEAM ENGINEER, T. C. I. CO., STUDYING THE COTTON WAREHOUSE

gineer, Providence, R. I., who stated, "Briefly, this question is a problem of management and I wish to emphasize the necessity of having a permanent body of competent men in charge of the entire program—a body that is not elected for four years and that cannot be changed at election time."

A symposium on industrial preparedness consisting of liberal extracts from the discussion at the New Orleans meeting is presented elsewhere in this issue. Additional discussions by H. L. Gantt, management engineer, New York; L. P. Alford, editor, *The American Machinist*, New York; E. H. Neff, New York manager, Brown & Sharpe Mfg. Co., and others, will be published in *The Iron Trade Review*, April 27.

In an informal discussion, Calvin W. Rice, secretary, A. S. M. E., told of the steps being taken to give the Naval Consulting Board permanent legal standing. He also stated that over 15 years ago the first steps were taken to interest the war department in the formation of a corps of civilian engineers. The industrial census outlined in Mr. Miller's paper, said Mr. Rice, will include 30,000 plants, and the work will be executed for the joint benefit of the army and the navy.



BARBECUE AT BAYVIEW, BIRMINGHAM, WITH INSET SHOWING DR. JACOBUS, S. T. WELLMAN OF CLEVELAND, AND PROF. WALKER TALKING OVER THE EVENTS OF THE DAY

Wilson Backs Up Plan

That the work of the American Society of Mechanical Engineers in organizing for industrial preparedness has received support in high official circles in Washington is attested by the receipt of communications at the New Orleans convention from Josephus Daniels, secretary of the navy, and from the President. The President's letter accompanies this report. Mr. Daniels wired as follows:

"Accept my thanks and appreciation for your letter of April 5, and the very interesting paper of Mr. Miller, which you enclosed therewith. Permit me again to express my appreciation of the service your society is rendering to the country."

Both of these communications indicate that proper organization for industrial preparedness is considered fully as important as the direct problem of maintaining men in the field.

The Thursday morning session was devoted to the presentation and discussion of papers dealing with engineering problems peculiar to New Orleans, including sugar refining, pumping and stevadoring. These papers are as follows: "Capacity and Economy of Multiple Evaporators," by E. W. Kerr, professor of mechanical engineering, Louisiana State University, Baton Rouge, La.; "The Evolution of Low-Lift Pumping Plants in the Gulf Coast Country," by W. B. Gregory, professor of experimental engineering, Tulane University, New Orleans; and "Mechanical Equipment Used in the Port of New Orleans," by William von Phul, of Ford, Bacon & Davis, engineers, New Orleans.

Simultaneous sessions were held on the last day, Friday, April 14, one being devoted to the measurement of the flow of fluids and the other to miscellaneous engineering topics.

A paper by Francis P. Fisher, assistant general manager, Wichita Natural Gas Co., Bartlesville, Okla, entitled "Establishing a Standard of Measurement for Natural Gas in Large Quantities," is published in full elsewhere in this issue. This paper was presented at New Orleans by Prof. P. F. Walker, dean, school of engineering, University of Kansas, Lawrence, Kas. The discussion, which was participated in by Prof. Walker, W. F. M. Goss, dean, college of engineering, University of Illinois, Urbana, Ill., and G. T. Voorhees, refrigeration engineer, New York, indicated that great strides have been made in the past decade in the development of apparatus for accurately measuring natural gas and for preventing losses through leakage of mains, etc.

A contribution closely related to Mr. Fisher's paper was presented by Robert F. Earhart, professor of physics, Ohio State University, and S. S. Wyer, consulting engineer, Columbus, Ohio, in a paper entitled "Deviation of Natural Gas from Boyle's Law."

In this paper the magnitude of the natural gas compressing and measuring problem, and known data regarding probable deviation of natural gas from Boyle's law, are summarized. The data show conclusively that all of the observed deviations of natural gas from Boyle's law are in one direction—in favor of the buying company where gas is measured under high pressure conditions, that the different gases have marked peculiarities and marked differences of deviation, that there is no direct relationship between the deviation and ethane content, and that the direct application of Boyle's law to high pressure natural gas measuring problems gives only an exceedingly rough approximation.

This paper was presented by Dean Goss in the absence of the author. Discussions were contributed by Prof. Walker, of the University of Kansas; C. N. Cross, assistant professor of mechanical engineering, Leland Stanford Jr. University, Stanford, Cal.; E. O. Hickstein, mechanical engineer, Wichita Natural Gas Co., Bartlesville, Okla.; T. R. Weymouth, chief engineer, United Natural Gas Co., Oil City, Pa.; G. A. Burrell, I. W. Robinson, and others. The discussion brought out the importance of the work and showed the necessity for considerable further investigation.

An exhaustive paper on the flow of water through pipe orifices was presented by Horace Judd, associate professor of experimental engineering, Ohio State University, Columbus, O.

Dynamic Balancing

In an exceedingly interesting paper on the dynamic balancing of machine parts by N. W. Akimoff, engineer, Dynamic Balancing Machine Co., Philadelphia, it was stated that, "Dynamic balance is a part of mechanics of engineering and not merely a shop method. The problem is perfectly capable of a definite solution if proposed in a rational manner and treated along rational lines. The importance of running balance in high speed machinery is well understood. The author separates the problem into two parts, static and dynamic bal-

ance, and explains dynamic unbalance by the so-called centrifugal couple. He describes his machine for creating a centrifugal couple at will, which may be adjusted by trial to exactly counteract the one that may be present in the body to be tested. This additional couple is created in the machine by means of a so-called squirrel cage, which at the same time permits of definitely establishing the plane and the sign, and of estimating the exact numerical value of the centrifugal couple of the body."

This paper will be published in full in a forthcoming issue of *The Iron Trade Review.*

A discussion was presented by Francis Hodgkinson, mechanical engineer, Westinghouse Machine Co., East Pittsburgh, Pa., which is in part as follows:

"Mr. Akimoff describes a very ingenious device for dynamically balancing rotating bodies. It seems to me, however, that it is open to the objection that the member to be dynamically balanced must be put in perfect static balance before being balanced by the means described. This is quite difficult, in the case of heavy revolving bodies, and is not to be satisfactorily attained by the usual method of rolling the body on ways. Therefore, it seems to me that a machine for dynamic balancing should also render possible the elimination of errors in static balance. As a matter of fact a very well organized system of adding weights may be employed, which renders both the static and dynamic balancing of the body a simple operation. Generally speaking, it is the practice of the Westinghouse companies to employ such a method for all larger revolving fields, as well as for the occasional time when a turbine rotor may require dynamic balancing because some element of it is out of static balance. For small generator rotors a Norton balancing machine is successfully employed and an additional machine similar to that described by Mr. Akimoff is about to be added."

In another discussion of this paper, R. M. Riddell, mechanical superintendent, General Electric Co., Schenectady, N. Y., states that

"The use of balancing machines has now become universal and the results generally are satisfactory. It becomes simply a matter of selecting the type of machine deemed most suitable for the particular kind of work to be done, more particularly depending on the degree of perfection to which the rotor should be balanced. The writer's experience is that the vertical type of balancing machine gives the most perfect balance, owing, no doubt, to the fact that there are no bearings to influence the running of the rotor. Also since the rotor is suspended, it can run out and show the amount of "out" much more easily than if supported in bearings. I also wish to say that in my opinion, it is a useless and wasteful practice, except in a very few specific cases, to give a body static balance if a dynamic balance is to be produced finally."

In a further discussion, Frederick Hymans, engineer, Otis Elevator Co., New York, said:

"In the Akimoff machine it is quite immaterial if there is a phase difference between oscillations and exciting forces. As described, an additional couple is introduced, which can be so adjusted, in phase and magnitude, that the vibrations of the balancing machine vanish. It affords, therefore, at once the means to exactly determine both the plane and amount of unbalance. Disturbing influences, such as weakness of the shaft of the rotating body can practically be wholly eliminated by selecting a spring of a flexibility which is large as compared with that of the shaft. In other words, by the proper selection of the spring, the speed of rotation of the balancing machine can be made sufficiently low, so that the transverse vibrations which the centrifugal couple tends to set up in the shaft of the rotating body, will have practically no effect on the beam of the balancing machine. Looking at it from any angle it must be conceded that Mr. Akimoff has found a complete and practical solution of the problem, and with the advent of a machine with which a perfect balance can be obtained easily and accurately, there should be no reason why a perfect balance should not become the standard requirement for nearly all classes of rotating machinery."

Wilson Approves

In a letter to the American Society of Mechanical Engineers, received at the New Orleans convention, the President expressed his approval of the industrial preparedness propaganda in the following terms:

"It is with great pleasure that I acknowledge your letter of April fourth as it gives me the opportunity of expressing my appreciation of the high sense of loyalty and patriotism displayed by the members of the American Society of Mechanical Engineers in their prompt and earnest volunteer service to the government of this great republic. It is the kind of response that was expected from the members of your organization and is expressive of the real spirit of Americanism which is ever ready to serve the interests of our common country. In the hope that your meeting will result in your highest anticipation, I am,

Sincerely yours,

(Signed) "WOODROW WILSON."

In a written discussion of a paper entitled, "The Measurement of Viscosity and a New Form of Viscosity Meter," contributed to the New Orleans meeting by H. C. Hayes and G. W. Lewis, Swathmore College, Swathmore, Pa., E. H. Peabody, engineer, marine department, The Babcock & Wilcox Co., New York, stated:

"There is a crying need today for some international standard for the measurement of viscosity, and it is to be hoped that either the American Society of Mechanical Engineers, or some other, will initiate a movement which will result in this very desirable agreement of all authorities."

A paper dealing with the mathematical theory of the transmission of heat in boilers was contributed by E. R. Hedrick and E. A. Fessenden, University of Missouri, Columbia, Mo.

Southern Hospitality

The entertainment program of the New Orleans meeting was interesting and replete with southern hospitality. The arrangements were in charge of W. B. Gregory, Tulane University, chairman of the local committee. The recreation features included an excursion trip on the river, automobile inspection trips to typical Louisiana drainage projects, tea at Newcomb college, a reception at the New Orleans country club and the annual spring meeting ball at the Grunewald hotel.

A party of about 50 members stopped off at Birmingham, Ala., en route to New Orleans and were entertained by the members of the Birmingham section. The program included an inspection of the iron and steel works in the Birmingham district via special train, followed by an informal dinner at the Tutwiler hotel. The Birmingham committee was headed by R. E. Brakeman, assistant chief engineer, Tennessee Coal, Iron & Railroad Co., Ensley, Ala.

Edward N. Breitung is reported to have announced in New York that he has completed negotiations for a $20,000,000 syndicate to buy and operate a fleet of German and Austrian ships interned in this and other countries. Mr. Breitung stated that he is backed by capital in the Great Lakes region. He said that the plan had been submitted to representatives of the allied governments, and that he believed they would consent. The intention is to use the ships for South American and Asiatic trade.

M. S. Zortman, formerly connected with the Brown & Zortman Machinery Co., Pittsburgh, has organized the M. S. Zortman Machinery Co., which has offices at 507 Arrott building, Pittsburgh. The company is dealing in second-hand equipment.

About half a dozen expert mechanics from the plant of the New London Ship & Engine Co., Groton, Conn., have gone to Petrograd to work on submarines being built by the company for the Russian government. They will be gone about a year.

Preparing Our Industrial Reserve

The Engineer's Part in Mobilizing Country's Resources

New Orleans Meeting of the American Society of Mechanical Engineers Reveals That Many Have Initiated Measures for Promoting the "Get Ready" Campaign.

How Mechanical Engineers Feel About Preparedness

SPENCER MILLER presented before the spring meeting of the American Society of Mechanical Engineers at New Orleans last week a paper on "Organizing for Industrial Preparedness". The paper was designed to give concrete expression to the comprehensive efforts of various members of the engineering fraternity to properly marshal, classify and prepare the industrial resources of our country against prospective emergency.

Mr. Miller's paper brought clearly to the foreground one condition that yields splendid encouragement to those Americans who believe that patriotism and preparedness are synonomous terms. This condition was the revelation that practically every active member of the A. S. M. E. has taken this preparedness campaign seriously, are thinking deeply on the procedure necessary for its complete fulfillment, and in many cases have already adopted in their own shops, measures for bringing their organizations in line.

The contribution of Mr. Miller, therefore, served not to attract the surprised comments of the unready and the skeptical, but rather to uncover the mature deliberations of those who already had initiated a preparatory program of their own.

This discussion of preparedness was the most striking feature of any recent convention of the mechanical engineers, a fact that demonstrates the intense feeling the subject has aroused. The Iron Trade Review gave the widest publicity to Mr. Miller's paper in its issue of April 13, and is now performing a similar service for the discussion it attracted, convinced that only through publicity may the benefits that flow from the dissemination and collation of the best engineering thought of the country, be secured. Howard E. Coffin, chairman of the sub-committee on production, organization, manufacture and standardization, of the naval consulting board, who is in charge of the campaign for mobilizing our industrial reserve, discloses the engineer's viewpoint, as follows:

HOWARD E. COFFIN

"We as engineers and chemists have harnessed the resources of this country for the service of the people, and now at the direct request of the President of the United States we are asked to make a careful inventory of these resources for the use of our defensive line. A successful performance of this great task to which the governing bodies of our technical societies have pledged us cannot but bring the American engineer enhanced reputation and closer future relations with the national government."

Employers Should Pledge Workmen

BY HARRY E. HARRIS

General Manager, H. E. Harris Engineering Co.

THE PROGRAM for preparedness as it affects the engineering profession, and industrial America as a whole, is well thought out and should be supported by every engineer and manufacturer. However, there is one point which is of vast importance which could stand considerable emphasis and that is the outlined plan for organizing an industrial reserve. The labor conditions and troubles in foreign countries now at war, have been a serious hindrance to the effectiveness of their offensive and defensive forces, due to interference with the furnishing of proper supplies to the men at the front.

It is not only necessary to enlist the engineers and the manufacturers, but also to secure the loyal support of every man who is a skilled workman and who is necessary to this country as such. Let these skilled employes know more about the plans of the industrial preparedness program, enlist their sympathies and obtain their pledge of willingness to be depended upon in case of emergency. Make them feel that in case America is called upon to defend herself that their interests and their employer's interests are in a common cause, and that the employers and the men will stand shoulder to shoulder in such an emergency. Skilled workmen who are floaters and otherwise undependable, are of no value as a part of the industrial bulwark of the nation, and will hesitate to pledge themselves to the country's service in time of need. It is well to know upon whom dependence may be placed to stand at their posts when called by their country, and for employers to give such as can be relied upon, the responsible positions in their factory organization.

It is up to employers who are patriotically inclined and willing to give their support to their country, to reach the men by individual talks, meeting them on common ground, and obtaining their views and their willingness to enlist as members of the industrial reserve if called upon. In view of the present conditions of unrest, it does not seem as though any time should be lost in making a coalition as far as possible, between the employer and employe on a patriotic basis.

As an example of what may be done along this direction, the company with which I am connected invited the men to meet together. Abstracts from the paper written by Mr. Miller were read, and a general discussion invited. Men who for various reasons had neglected to

take out their naturalization papers were earnestly advised to do all they could to get on record as to their intentions. Men who had their first naturalization papers, but not their second, were also given similar advice, and every man invited to join in forming an association, pledging themselves to put all other considerations aside in case of a call for the defense of the country, and to serve in its defense as members of the industrial reserve.

The resolution is as follows:

We the undersigned, do solemnly and patriotically pledge ourselves to the defense of the United States of America in case of war against any enemy whatsoever.

We have associated ourselves together as members of the Square Deal Industrial Volunteer Association, employes of the H. E. Harris Engineering Co., and as native and naturalized citizens of the United States of America, and further voluntarily pledge ourselves to patriotically serve in the industrial reserve of the United States of America as skilled workers of the H. E. Harris Engineering Co., whenever called upon by the government to do so, irrespective of our several religious, political beliefs, other associations, prior nationalities, antecedents or individual prejudices.

This pledge and agreement is binding upon the Square Deal Industrial Volunteer Association as a whole, but any member leaving the employ of the H. E. Harris Engineering Co., and being released from his membership in the above association prior to the call of the United States government, is also automatically released from this pledge.

The men evinced a hearty interest and exhibited a large share of patriotism, and demanded permission to sign at once with the exception of one or two unskilled men who were desirous of joining either the navy or army in case of war. There were no restrictions made in regards to the men's prior nationality, or whether he had obtained his naturalization papers, partially or completely. If any aliens wished to sign, they were allowed to do so after signifying their intentions of becoming citizens of the United States at the earliest opportunity.

The speaker was able to come down here with the feeling that the men in his company's factory were 100 per cent strong in patriotism, and with the feeling that he could offer his country and the naval consulting board the support and services of his company, and its employes as a unit, without a dissenting voice.

Putting Preparedness Up to Congress

BY EARNEST H. PEABODY
Engineer, Babcock & Wilcox Co.

THE mistake Spencer Miller's paper makes, whether intended by the author or not, is in presupposing that the enormous work of organizing for industrial preparedness can be effectively projected and completed with the dispatch which the circumstances make imperative by the engineering fraternity of this country as represented by the engineering societies, working in the odd moments snatched from the task of making a living, without compensation and paying its own expenses. It is indeed a satisfaction for us all to know that this important movement is being carried forward to far better purpose than the facilities available might promise. The mere preliminary step of making an industrial inventory is a tremendous piece of work in itself. Can it be done by a society like ours, or by representatives of similar societies? May we expect that even the enthusiastic army of engineer census-takers referred to by the author can satisfactorily accomplish this important work in the little time available and with, comparatively speaking, a limited backing? Have we time to do it in this way? I think not.

It is our government which must do this work, and not the United States naval consulting board, whatever may be the enthusiasm, self-sacrifice and ability of its members, and whatever may be the help which this society's membership at large can give. I believe that the step that this society should take are those which will put pressure upon our legislators with the effect of making an organized government measure of this industrial census and all the thousand other important features which must be included in complete preparedness against war. It is a mistake, in my opinion, to allow the impression to go abroad that the work which the naval consulting board has begun is sufficient and satisfactory, and that it will fulfill the great needs of our country. We must go deeper to make this work effective; we must bend our enegries along the line of stimulating public opinion, so that our representatives at Washington will be impressed and take the necessary steps to make the whole question of preparedness a government policy.

The appointment of the United States naval consulting board was an inspiration and of incalculable benefit to the country, but anything short of putting this matter of preparedness straight up to the legislative and executive heads of our government as a national duty, is merely playing with a vital problem.

Lessons from American Munition Making

BY BERNARD M. FINE
Chief Tool Designer, American Steam Gage & Valve Mfg. Co.

THE subject of industrial preparedness, while falling within the engineer's scope, should interest us also as citizens. As citizens we will have to meet the cost, and one good way to reduce it is to apply consolidated engineering experience to this problem and endeavor to put the design and construction of war material upon a basis similar to what is customary in the commercial field.

In order to get production on the foreign contracts, the limits had to be changed. This is too much like swapping horses in midstream. The time to do that is now, and it is really within the range of engineering work to assist the war office in modifying its standards.

To store in time of peace an amount of material equal to the needs of war would not be wise, but in times of peace let us educate ourselves to be adequate to meet this need. The industrial force must be officered by men trained in the peculiarities of munition manufacture. This is the work of engineers and the engineering societies should make the organizing of these men their business and keep alive the work by requesting the presentation of papers on the subject.

The delay that was occasioned in starting on foreign war orders was due to the fact that the contractor accepted orders to which his machine tool equipment was inadequate. A grand scramble was made upon the markets, but as the demand was abnormal it could not be met. As a result many manufacturers pressed into service anything that resembled a machine tool and then improvised crude fixtures, all to the point of great expense and delay. This deplorable condition we can avoid by means of Mr. Miller's system of cataloging adaptable equipment. We will then be sure that a contractor gets orders for only those component parts that his equipment will handle. If we start now and line up the men adaptable for this work, or if we can get the war office to take these steps, we will have rendered the nation an invaluable service.

With a few exceptions, our munition plants are concentrated on the Atlantic coast. This is in itself a danger, and steps should be taken so that in an emergency the work could be shifted to any section.

Getting More for Uncle Sam's Money

BY FRED J. MILLER
Works Manager, Remington Typewriter Co.

ENGINEERS have always paid far more attention to efficient organization than others, and it seems to me that they might render their best possible service at this time by suggesting such improvements in organization as would result in getting more for the money and effort expended than is at present secured.

The army budget of the United States for the year 1913-1914 was $146,000,000. France, Germany and Russia were the only nations that spent more money in the period named than we spent, and the figures given do not include our state troops but only the federal budget. Yet we are told that our army is a negligible factor, and that even such a job as pursuing a few bandits over the Mexican border its showing is pitiful.

If that is so, and if the same is true of our navy, then is it not time for us to try to dscover what the $146,000,000 does buy, and whether or not some results worth while can be secured by such an expenditure?

Modern warfare has been shown by the war now going on in Europe to be more than ever an engineering operation. It is organization pitted against organization, and machine pitted against machine. Preparation for war is also largely an engineering work and the nation which does most in making this work of preparation efficient, that is, in getting the largest possible results for each dollar expended, will have gone a long way in the work of preparedness, and will get the best support of its people upon whom the burden of taxation falls.

Preparedness Involves United Effort

BY J. P. BROPHY
General Manager, Cleveland Automatic Machine Co.

INDUSTRIAL preparedness is an extremely vital question and the word "industrial" is so deep and reaches so far that it requires a vast amount of labor to impress those in a country of such magnitude as ours what it actually means.

It might easily be said that this country has at all times been awake to the meaning of the word "industrial" because we have up to the present time in all sections of the world been considered real leaders in a vast number of enterprises. To improve upon what has happened in the past, when considering the future, means a genuine amalgamation of all with whom we deal. This means that the leading business men should have one thought and that, never to allow the business of this country to go backwards, always having in mind progressiveness, even on a stronger basis than it has ever been before.

The word preparedness has great depth of meaning. To attempt to do anything unprepared in most cases is somewhat disastrous. I have in mind that the big thing in the way of preparedness in any undertaking means the best use of our thinking powers to plan in advance and follow the path of being ever ready to meet the enemy from a business standpoint.

Competition from all sections of the world, after the war ceases, will be somewhat severe, although a vast number of bright business men are under the impression that we control the world from a manufacturing standpoint. Perhaps we do in a certain sense of the word, but what is occurring abroad means that the men in business should, if possible, have those in their employ thoroughly satisfied and willing to work along as an organized body. It means a homogeneous mass of brain power, all thinking in one direction, and constantly having in mind self-protection.

The word "industrial" as used in this argument, cannot be considered of benefit to this great nation if it is not genuinely universal. An educational campaign seems absolutely necessary and the newspapers are the best channels through which to reach the people of this nation, teaching them to cling and work together, and this must be done with a great pride for our own country.

After the war it will be absolutely necessary for all lines of business in this country, in order to meet European competition, to be prepared to stand the test. It is certainly bound to come, and must be met. It is a difficult problem and it will take a vast amount of time to get those interested in business, as well as the working men, to thinking in the same direction.

In the first place our banking facilities are extremely inadequate and in order to do business in foreign countries, especially those that are practically new to us, it will be necessary to have complete banking arrangements. Furthermore, when we seriously consider doing business with South America, our merchant marine is not worth considering. Our product must be carried in the ships of our competitors. This is a lamentable condition which will take a long time to improve.

In the writer's opinion, industrial preparedness must be forced to a successful issue through the channels of governmental control. It means the proper distribution of advice through the daily papers, thereby instilling into the minds of the masses the actual meaning of this word "industrial". Otherwise, we can never expect much harmony from the many conflicting notions, and

Men Who Will Direct Our Industrial Mobilization

In Each State One Man Has Been Appointed from the Ranks of Each of the Five Great Engineering Societies, Civil, Mechanical, Electrical, Mining and Chemical. These Men Are to be Known as State Directors, Their Duties Being Fully Explained on Page 815, The Iron Trade Review, April 13

W. S. Gifford, Chief Statistician, American Telephone & Telegraph Co., Supervising Director

Alabama

J. S. Sewell, Alabama Marble Co., civil; Priestly Toulmin, president Lehigh Coal Co., mining; F. H. Crockard, vice president Tennessee Coal, Iron & Railroad Co., mechanical; Theodore Swann, sales manager, Alabama Power Co., electrician; B. B. Fross, professor chemistry, Alabama Polytechnical Institute, chemical.

Alaska

John Wulzen, Alaska Gold Mines Co., civil; Philip R. Bradley, Alaska Treadwell Gold Mining Co., mining; George A. Diamond, manager, Scheid & Co., mechanical; Louis E. McCoy, Juneau, electrical; W. P. Lass, Juneau, chemical.

Arizona

J. B. Girard, Phoenix City, engineer, civil; John C. Greenway, general manager, Calumet & Arizona Mining Co., mining; A. G. McGregor, Calumet & Arizona Mining Co., mechanical; David W. Jones, chief electrician, Arizona Copper Co., Ltd., electrical; Frank N. Guild, University of Arizona, professor of chemistry and mineralogy, chemical.

Arkansas

Charles H. Miller, president, Miller Engineering Co., civil; J. R. Fordyce, president, Thomas Fordyce Mfg. Co., mining; B. N. Wilson, professor mechanical engineering, University of Arkansas, mechanical; W. N. Gladson, dean, College Engineering, University of Arkansas, electrical; J. B. Rather, agricultural experiment station, professor agricultural chemistry, chemical.

California

Wynn Meredith, Sanderson & Porter, civil; G. W. Dickie, San Francisco, mining; C. W. Merrill, Merrill Metallurgical Co., mechanical; A. H. Babcock, Southern Pacific Power Co., electrical; Edmund O'Neill, Berkeley, Cal., professor chemistry, University of California, chemical.

Colorado

H. C. Crocker, Denver, civil; D. W. Brunton, Denver, mining; T. B. Stearns, Denver, mechanical; W. S. Aldrich, associate professor electrical engineering, Colorado Agricultural College, electrical; R. B. Moore, United States bureau of mines, chemical.

Connecticut

H. R. Buck, Ford, Buck & Sheldon, Inc., civil; Eli Whitney, president, N. & N. H. Trust Co., mining; H. B. Sargent, vice president, Sargent & Co., mechanical; Samuel Ferguson, vice president, Hartford Electric Light Co., electrical; E. W. Morley, West Hartford, chemical.

Delaware

Andrew Bryson, president, Brylgon Steel Casting Co., civil; Thomas Coleman Du Pont, mining; R. W. Smith, vice president, Hilles & Jones Co., mechanical; W. C. Spruance Jr., E. I. Du Pont de Nemours & Co., electrical; Charles L. Reese, E. I. Du Pont de Nemours & Co., chemical.

District of Columbia

C. B. Hunt, engineer highways, District of Columbia, civil; Hennen Jennings, mining; Dr. W. S. Stratton, bureau of standards, mechanical; John H. Finney, southern manager, Aluminum Co. of America, electrical; Charles L. Parsons, United States bureau of mines, chemical.

Florida

L. R. McLain, St. Augustine, civil; Robert N. Dickman, St. Augustine, mining; R. E. Chandler, professor mechanical engineering, University of Florida, mechanical; C. S. Hammatt, president, Consolidated Engineering Co., electrical; E. R. Flint, professor chemistry, University of Florida, chemical.

Georgia

G. R. Solomon, Solomon-Narcross Co., civil; S. W. McCallie, state geologist, mining; Oscar Elsas, president, Fulton Bag & Cotton Mills, mechanical; A. M. Schoen, Southeastern Underwriters' Association, electrical; F. N. Smalley, chief chemist, Southern Cotton Oil Co., chemical.

Idaho

M. S. Parker, St. Maries, civil; Stanley A. Easton, Kellogg, mining; George F. Waddell, Squirrell, mechanical; O. G. F. Markhus, general superintendent, Electrical Investment Co., electrical; J. Shirley Jones, director of experiment stations and chemist, University of Idaho, chemical.

Illinois

R. W. Hunt, Chicago, Ill., civil; Frederick K. Copeland, president, Sullivan Machinery Co., mining; Dr. W. F. M. Goss, dean, college of English, University of Illinois, mechanical; P. Junkersfeld, Commonwealth Edison Co., electrical; William Hoskins, Mariner & Hoskins, chemical.

Indiana

William K. Hatt, professor of civil engineering Purdue University, civil; George P. Hulst, International Lead Refining Co., mines; George O. Rockwood, president, Rockwood Mfg. Co., mechanical; F. S. Hunting, vice president, Fort Wayne Works of General Electric Co., electrical; H. E. Barnard, state food and drug inspector, commissioner of weights and measures, chemical.

Iowa

George H. Boynton, president, Northern Gravel Co., civil; E. A. Sayre, general manager, Eagle Coal & Mining Co., mining; S. M. Woodward, professor mechanics, State University of Iowa, mechanical; Norman T. Wilcox, sales manager, Mississippi Rover Power Co., electrical; W. T. Coover, chairman, department of chemistry, Iowa State College, chemical.

Kansas

D. H. Whitmer, president and general manager, Whitmer Contracting Co., civil; H. G. Hixon, metallurgist, Prime Western Spelter Co., mining; A. A. Potter, dean, division of engineering, Kansas State Agricultural College, mechanical; George C. Shaad, professor electrical engineering, University of Kansas, electrical; W. A. Whitaker, associate professor metallurgy, University of Kansas, chemical.

Kentucky

Richard Montfort, Louisville & Nashville R. R., civil; Frank D. Rash, vice president, St. Bernard Mining Co., mining; W. S. Speed, president, Louisville Cement Co., mechanical; Carl P. Nachod, president, Nachod Signal Co., electrical; A. M. Breckler, Janes & Breckler, chemical.

Louisiana

Arsene Perriliat, M. E. Hercules Co., Ltd., civil; A. M. Lockett, president, A. M. Lockett Co., Ltd., mechanical; M. S. Sloan, general manager, New Orleans railway & Light Co., electrical; W. L. Howell, chemist, Appraiser's Laboratory, chemistry.

Maine

E. C. Jordan, Portland, civil; R. H. Richards, professor mining, Massachusetts Institute of Technology, mining; J. S. Hyde, president, Bath Iron Works, mechanical; W. S. Wyman, president and general manager, Central Maine Power Co., electrical.

Maryland

H. D. Bush, box 1152, general superintendent, Baltimore warehouse, Carnegie Steel Co., civil; W. H. Peirce, vice president, Baltimore Copper Smelting & Rolling Co., mining; C. C. Thomas, professor of mechanical engineering, Johns Hopkins University, mechanical; J. B. Whitehead, professor of electrical engineering, Johns Hopkins University, electrical; W. B. D. Penniman, Penniman & Brown, chemical.

Massachusetts

Fayette S. Curtis, president, Old Colony R. R. Co., civil; W. E. C. Eustis, Boston, mining; Ira N. Hollis, president, Worcester Polytechnic Institute, mechanical; C. E. Edgar, president and general manager, Edison Electrical Illuminating Co. of Boston, electrical; A. D. Little, president, A. D. Little, Inc., chemical.

Michigan

G. S. Williams, Ann Arbor, Mich., civil; M. M. Duncan, general manager, Cleveland-Cliffs Iron Co., mining; Alex Dow, president, Detroit Edison Co., mechanical; H. H. Crowell, president, Michigan Railway Co., electrical; H. T. Graber, chief chemist, Digestive Ferments Co., chemical.

Minnesota

William L. Darling, chief engineer, Northern Pacific Ry. Co., civil; H. V. Winchell, Minneapolis, Minn., mining; J. J. Flather, professor mechanical engineering, University of Minnesota, mechanical; William N. Ryerson, general manager, Great Northern Co., electrical; G. B. Frankforter, professor of chemistry, dean, school of chemistry, University of Minnesota, chemical.

Mississippi

M. L. Lynch, Jackson, civil; no resident mining engineer; R. C. Carpenter, Agricultural College, professor of mechanical engineering, mechanical; J. T. Robertson, secretary, Mississippi Inspection & Advisory Rating Co., electrical; William F. Hand, professor of chemistry, Mississippi Agricultural and Mechanical College, chemical.

Missouri

Daniel Bontecou, Kansas City, civil; P. N. Moore, St. Louis, mining; E. Flad, St. Louis, mechanical; Charles S. Ruffner, president, Mississippi River Power Distributing Co., electrical; L. F. Nick-

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dilatory and fragmentary opinions which are existent today.

From the working man's standpoint he should be educated to the fact that all business obtained from the countries in question, enabling us to produce in large quantities in our factories, is without question of great assistance to the man who toils. The man who toils in this instance has to work in conjunction with the man who has the dollars to spend to build factories to enable us to produce the necessary product, thereby meeting the demand of increased business. This is a complete justification of trying to educate the masses as to what industrial preparedness actually means. It is not the intention to place dollars in the pocket of the business man. It is bound to assist the workers.

Relations of capital and labor must be adjusted in a harmonious manner, so as to avoid being so antagonistic.

Government Ownership Provokes Distrust

BY WILLIAM B. JACKSON

Consulting Engineer

THERE is a tendency on the part of many who have not given the matter much consideration to feel that the government might place itself in a position to erect its own manufacturing establishments capable of fulfilling all of the requirements of preparedness and to produce the necessary supplies and equipment to enable our country to withstand a serious attack from outside nations. The sooner such an idea is rooted out of the minds of our people, the better. At best, the government can only own and operate what might be considered sample establishments for the production of the materials and supplies which would be necessary in case of a serious attack upon this country. At first it may be somewhat difficult to grasp the fact that were the United States to be attacked by a formidable foe, it would require the most intense activity of any government agencies for making munitions and supplies, together with the greatest activity of every private manufacturing establishment that could be pressed into service. One of the things clearly demonstrated by the present war is the tremendous advantage gained by the country that is able to start into the fight with the ability to provide at once the necessary supplies to keep the organization going. This is entirely aside from the question of trained officers, engineer corps, soldiers and seamen.

One disquieting feature of our present situation is that manufacturing establishments do not feel safe in making broadly conceived and comprehensive plans for assisting the government in case of trouble. There appears to be no reason for them to feel that the government itself may not enter their fields of activity and take away from them the business which might with propriety come to their hands during the periods of peace. It would appear that this move on the part of the government to work up a thorough census of the industrial possibilities of our country as a part of the work of our naval consulting board, should lead to the development of a plan whereby our manufacturing establishments may be brought into hearty co-operation with the government with profit both to the manufacturer and to the government.

Train Shops Before Emergency Arises

BY FRED E. ROGERS

Editor, Machinery

A VERY large munitions plant would be required to run steadily for a year to turn out the shells fired by the allies' guns in one day on the western battle front. To provide the millions of shells used by them the united efforts of thousands of manufacturing plants have been required. But these plants had to be provided with drawings, tools, gages, jigs and fixtures and plans of operations before they could begin to produce. It has been due to their lack that Great Britain has been so slow in getting ready.

Take, for example, the manufacture of military rifles. This is a complex process requiring special skill and experience, and with the exception of our government arsenals there was, at the outbreak of the present war, perhaps not one plant in the United States properly equipped and manned for manufacturing military arms that would pass the rigid test prescribed by government inspectors. There are about 800 principal machine operations involved in making the parts of the simplest military arm, including the wood stock and hand guard. Many of these operations require special machinery and practically all the parts must be held in jigs or fixtures during the machining operations. When we consider the fact that to provide for an army of 1,000,000 men, from 2,000,000 to 3,000,000 rifles are required, the size of the task of equipping an army of a million with shoulder guns alone becomes apparent. What the condition of this country would be in a sudden emergency, we can only guess. Judging from the experience of some of our ill-advised manufacturers, who undertook to make shells, it would be one of great confusion and enormous waste. While it is true that the means of production of munitions are in our machine shops, mills and factories, they must be supplemented by the drawings, specifications, jigs, fixtures, tools and plans of operations. These latter can be made ready for immediate distribution to the plants selected for each specific product.

Comprehensive plans should be prepared for the manufacture of shrapnel, high explosive shells, cartridge cases, rifles, field guns and all the varied equipment of war. Every step of the operations should be laid down, specifying in each instance the tool and the machine on which the work should be done and the limits of accuracy required, including an estimate of the possible production. It will be a great undertaking, but how much better it will be to spend a few million dollars working out plans to provide means for industrial mobolization and rapid production, than to run the risk of a complete smash-up in time of stress. Perhaps in some cases, selected plants should be required to produce some parts even though only a few are made. When these parts have been actually produced, there will be in that plant knowledge of the conditions and methods that should not be speedily forgotten.

It is true that all plans, tools, jigs, fixtures and methods of operations will become obsolete when improvements in the means of production and arms are developed, as they certainly will be. But is it not better to face this

Men Who Will Direct Our Industrial Mobilization

In Each State One Man Has Been Appointed from the Ranks of Each of the Five Great Engineering Societies, Civil, Mechanical, Electrical, Mining and Chemical. These Men Are to be Known as State Directors, Their Duties Being Fully Explained on Page 815, The Iron Trade Review, April 13.

(Concluded from page 883)

ell, assistant professor chemistry, Washington University, chemical.

Montana

Eugene Carroll, vice president, Butte Water Co., civil; J. L. Bruce, Butte & Superior Copper Co., mining; C. V. Nordberg, Nordberg Mfg. Co., mechanical; M. H. Gerry Jr., Engineering Corporation, electrical; E. P. Mathewson, manager, Washoe Reduction Works, Anaconda Copper Mining Co., chemical.

Nebraska

Elliot Holbrook, Omaha, Southern Pacific Co., civil; Walter T. Page, manager, Omaha plant, American Smelting & Refining Co., mining; William R. McKeen, president, McKeen Motor Car Co., mechanical; H. A. Holdrege, general manager, Omaha Electric Light & Power Co., electrical; C. F. Crowley, prefessor chemistry, Creighton University, chemical.

Nevada

W. T. Gould, Reno, Nevada-California-Oregon Railway, civil; W. E. Trent, Reno, Trent Engineering Co., mining; James G. Scrugham, Reno, dean of engineering, University of Nevada, mechanical; W. K. Freudenberger, chief engineer of Nevada, electrical; Maxwell Adams, professor of chemistry, University of Nevada, chemical.

New Hampshire

Robert Fletcher, director and professor of engineering, Thayer School of Engineering, civil; H. R. Batcheller, Washington, mining; Thomas W. Fry, secretary, Sullivan Mechanical Co., mechanical; J. Brodie Smith, vice president, Manchester Traction, Light & Power Co., electrical; Hugh K. Moore, chief chemist, Berlin Mills Co., chemical.

New Jersey

Morris R. Sherrerd, chief engineer, department public works, civil; B. F. Cresson Jr., chief engineer state board of commerce and navigation, mining; H. L. Gantt, mechanical; Farley Osgood, assistant general manager, Public Service Electric Co., electrical; H. S. Miner, chief chemist, Welsbach Light Co., chemical.

New Mexico

O. H. B. Turner, chief engineer, St. Louis, Rocky Mountain & Pacific Co., civil; Stephen O. Andros, Albuquerque, mining; L. J. Charles, chief engineer, United States reclamation service, mechanical; J. L. Brenneman, professor of physics and electric engineering, University of New Mexico, electrical; John D. Clark, professor of chemistry, University of New Mexico, chemical.

New York

James G. White, president, J. G. White & Co., civil; Charles F. Rand, Spanish-American Iron Co., mining; W. H. Marshall, president, American Locomotive Co., mechanical; Wm. McClellan, New York City, electrical; T. B. Wagner, manager, Corn Products Refining Co., chemical.

North Carolina

J. L. Ludlow, consulting, municipal, sanitary and hydraulic engineering, civil; Joseph H. Pratt, state geologist, mining; William S. Lee, Mercantile building, chief engineer, Southern Power Co., mechanical; Chas. I. Burkholder, general manager, Southern Power Co., electrical; F. P. Venable, professor chemistry, University of Northern Carolina, chemical.

North Dakota

T. R. Atkinson, Bismarck, city engineer, civil; no resident mining engineer; Calvin H. Crouch, dean College Mechanical and Electrical Engineering, University of North Dakota, mechanical; John F. Stevens, assistant professor electrical engineering, University of North Dakota, electrical; Edwin F. Ladd, president, North Dakota Agricultural College, chemical.

Ohio

Chester W. Larner, Wellman-Seaver-Morgan Co., civil; Charles S. Robinson, second vice president, Youngstown Sheet & Tube Co., mining; Frank A. Scott, vice president, Warner & Swasey Co., mechanical; Samuel G. McMeen, president, Ohio State Telephone Co., electrical; James R. Withrow, professor industrial chemistry, Ohio State University, chemical.

Oklahoma

H. V. Hinckley, Oklahoma City, civil; M. M. Valerius, Valerius, McNutt & Hughes, mining; H. V. Bozell, director, School of Electrical Engineering, State University of Oklahoma, electrical; Edwin De Barr, professor chemistry, University of Oklahoma, chemical.

Oregon

Geo. C. Mason, vice president, Hurley-Mason Co., civil; A. M. Swartley, Bureau of Mines and Geology, mining; Bert C. Ball, president, Williamette Iron & Steel Works, mechanical; O. B. Coldwell, general superintendent, Portland Railway, Light & Power Co., electrical; O. F. Stafford, professor chemistry and director chemical laboratories, University of Oregon, chemical.

Pennsylvania

George S. Davison, president, Gulf Refining Co., civil; Vance C. McCormick, mining; Julian Kennedy, Pittsburgh, mechanical; Paul Spencer, United Gas & Improvement Co., electrical; R. F. Bacon, director, Mellon Institute, industrial research, University of Pittsburgh, chemical.

Rhode Island

John W. Ellis, president, manager, Providence Gas Co., civil; Walter M. Saunders, Saunders & Franklin, mining; Henry D. Sharpe, treasurer, Brown & Sharpe Mfg. Co., mechanical; L. W. Downes, vice president and general manager, D. & W. Fuse Co., electrical; J. E. Bucher, professor chemistry, Brown University, chemical.

South Carolina

John McNeal, City Hall, Columbia, S. C., city engineer, civil; H. L. Scaife, Clinton, mining; J. L. Coker Jr., vice president, Carolina Fiber Co., mechanical; W. M. Riggs, president, Clemson Agricultural College, electrical; R. N. Brackett, director chemical department, Clemson Agricultural College, chemical.

South Dakota

Bruce C. Yates, assistant superintendent, Homestake Mining Co., civil; Allan J. Clark, metallurgist, Homestake Mining Co., mining; M. W. Davidson, professor mechanical engineering, University of South Dakota, mechanical; B. B. Brackett, professor electrical engineering, South Dakota State College, electrical; Wm. J. Sharwood, metallurgical chemistry, Homestake Mining Co., chemical.

Tennessee

William W. Carson, professor civil engineering, University of Tennessee, civil; A. A. Blow, president, Carolina Copper Co., mining; N. Sanders, Newell Sanders Plow Co., mechanical; F. G. Proutt, Memphis, electrical; J. F. Norris, professor of chemistry, Vanderbilt University, chemical.

Texas

John B. Hawley, Fort Worth, civil; Arthur J. McQuatters, El Paso, mining; W. B. Tuttle, vice president, San Antonio Traction Co. and San Antonio Gas & Electric Co., mechanical; Fred A. Jones, Dallas, electrical; George W. Gray, chairman, Manufacturing Committee of the Texas Co., chemistry.

Utah

A. F. Parker, Ogden, civil; Lafayette Hanchett, director, National Copper Bank and Bankers Trust Co., mining; William Wraith, general manager, International Smelting Co., mechanical; Markham Cheever, chief engineer, Utah Power & Light Co., electrical; William C. Ebaugh, chief chemist, United States Smelting Co., chemical.

Vermont

Frank O. Sinclair, Burlington, civil; C. B. Hollis, general superintendent, Eastern Talcum Co., mining; J. Hartness, president, Jones & Lamson Machine Co., mechanical; B. T. Burt, vice president, Rutland Railway, Light & Power Co., electrical; G. H. Burrows, professor chemistry, University of Vermont, chemical.

Virginia

E. T. D. Myers Jr., director, Commonwealth Coal Corporation, civil; Frank U. Humbert, manager mines, Low Moor Mining Co., mining; W. D. Mount, general manager, Mathieson Alkali Works, mechanical; Walter S. Rodman, professor electrical engineering, University of Virginia, electrical; Frank B. Carpenter, chief chemist, Virginia-Carolina Chemical Co., chemical.

Washington

A. O. Powell, Seattle, civil; J. C. Ralston, Spokane, vice president, Pacific Coast Pipe Co., mining; James V. Paterson, president, Seattle Construction & Dry Dock Co., mechanical; John Harisberger, general superintendent, light and power department, Puget Sound Traction, Light & Power Co., electrical; H. K. Benson, professor industrial chemistry, director bureau of industrial research, University of Washington, chemical.

West Virginia

A. M. Scott, Charleston, civil; I. C. White, state geologist, mining; Charles E. Ward, president, Charles Ward Engineering Works, mechanical; H. S. Sands, president, H. S. Sands Electric & Mfg. Co., electrical; A. R. Whitehill, professor chemistry, West Virginia University, chemical.

Wisconsin

D. W. Mead, professor Hydraulic Engineering, University of Wisconsin, civil; F. W. O'Neill, sales manager, Nordberg Mfg. Co., mining; L. E. Strathman, department manager, Allis-Chalmers Mfg. Co., mechanical; A. W. Berresford, vice president, Cutler-Hammer Mfg. Co., electrical; C. F. Burgess, president, C. F. Burgess Laboratories, chemical.

Wyoming

Edward Gillette, Sheridan, civil; W. D. Waltman, general manager, Franco-Wyoming Oil Co., mining; E. G. Hoefer, head of the department of Mechanical and Electrical Engineering, University of Wyoming, mechanical; P. N. Nunn, president, Wyoming Electric Co., electrical; R. B. Moudy, state chemist, professor of chemistry, University of Wyoming, chemical.

certainty and be ready to reconstruct the means of production and keep them up to date rather than to spend several hundred million dollars in the manufacture of these munitions which themselves become obsolete and practically worthless in a few years.

There is an argument for this sort of preparedness which should appeal to every engineer whether he is in favor of military preparedness or not. It can be made a powerful lever for improving industrial efficiency. It is unfortunately true that many of our manufacturing plants are working far below their possible efficiency. They employ penny-wise and pound-foolish methods of production; their men are not trained to understand the basic principles of interchangeable manufacturing. Gaging systems are inadequate and incomplete; data on the life of gages are wanting, as well as the number required for any given unit of production. There is, too, a lack of the co-operative spirit so absolutely necessary to success in any great trade or military emergency. Those emergencies will surely come to the United States, though, we trust, in the trade sense only. It will be only when we have co-operation in the true industrial sense that we can face with confidence great national emergencies.

Have Government Make Standard Gages

BY JOHN H. BARR

Consulting Engineer, Remington Typewriter Co.

THE tentative scheme of this inventory is probably adequate as a basis of development of many of the civil industries into military supply plants. Its provisions will facilitate the supply of such equipment as shoes, clothing, food, fuel, etc. In the matter of manufacture of arms and ammunition, however, it appears that special difficulties will arise, for uniformity and complete interchangeability is of the utmost importance in these most essential supplies.

A clause of the proposed agreement requires each shop to maintain corrected drawings and to construct one set of tools for such product as it may be called upon to supply. It would appear that the desired result may be more certainly attained by construction of such gages and tools in specially equipped government tool factories controlled by a highly expert staff and manned by workmen of corresponding skill. These government tool factories can construct all gages required and most of the important special tools. Drill jigs made in these factories can be used in any shop having suitable drill presses. Some variations exist among the machines of the numerous civil shops in the requirements as to drop forging dies, punch press dies and milling fixtures, but this will not seriously hamper the wholesale manufacture of such tools by the government tool factories. The large production concentrated in the government tool factories would be on a scale to permit real manufacturing methods in constructing standard tools.

There is one other advantage to this proposed production of all the important tools in government tool factories which also will tend to a uniform and high standard of product. The prosecution of this high-class tool manufacture will involve some considerable production in the government shops in thoroughly testing the equipment. This will develop a large corps of mechanics, skilled not only in the making of these tools, but very familiar with their use and the requirements to be met by their output.

In case it becomes necessary to utilize the industrial equipment of the country to the utmost, this corps of specialists would be a source from which to draw inspectors and instructors for duty in the private shops. Even one such man in a large private shop could render inestimable service in putting the plant upon an effective military basis. He would supply just what specialized technical knowledge which could not be expected of even the best of mechanics who necessarily lack extended experience in the production of munitions.

Good Transportation is Indispensable

BY JOHN YOUNGER

Chief Engineer, Pierce-Arrow Motor Car Co.

A NATION in arms may be considered as two vast bodies: one the fighting unit, the other the producing unit. My experience has shown me the tremendous importance of a third unit, the connection between the two, the transportation unit.

The production of any country is of little value if the transportation facilities are not ample to carry it. It must be remembered that in time of war the munitions will in general travel one way—toward the theater of operations. In time of peace, Buffalo, for example, exports by means of its railway systems to the eight points of the compass. Because of economic reasons these systems are proportioned in close accordance with the volume of traffic, and just now when there is an exceptionally large volume of freight passing through to eastern ports, the transportation facilities are found inadequate.

We are exporting only a small percentage of the supplies used on the European battlefields, and our transportation has not proved equal to the task. Germany, France and Russia had all built strategic railways leading to and paralleling their frontiers, but they did not stop at this. They also built good roads. They knew that every ton of freight carried on the railroad is some time or other always carried on a road, and they took the precaution of having the road as efficient as the railroad.

Good roads should be built to link up the small villages, the communities and townships with the railways and the big city. A good road is an economic investment in time of peace. In time of war it is the first and last link in the transportation scheme. Good roads carry munitions to the railway and they distribute them from it. It is useless to have a perfect railway, if it begins and ends in a bog.

Great Britain, France, Belgium, Russia and Italy have bought from us vast numbers of motor trucks. They have been making them themselves by the thousands, and still the supply is not adequate. Figures are not available but I would estimate that France alone, in actual military service, is probably using 50,000 motor trucks.

A vast army of men is kept exceedingly busy making and repairing roads. Munitions are being put on motor trucks in the industrial centers of England, carried along the roads to the desired port, thence the truck travels by steamer and completes its journey to the base depot along the roads.

The organization of our transport demands the attention of our engineering bodies, just as much as does the mobilization of our industrial resources. The standardization of our road systems, the standardization of the controls on our locomotive and motor trucks, so that men can change from one to another with all confidence, the education and disciplining of numbers of men to the principles of transportation are all matters that can only be handled by engineering executives.

A Use for Every Man

BY GEORGE R. HENDERSON

Consulting Engineer

THE point brought out by Mr. Miller, that for each man at the front, three are needed at home to prepare munitions of war, is a most interesting fact, especially to those who through age or physical disability, are prevented from entering the trenches or submarines. In organizing for industrial preparedness, the engineer who may not be directly connected with a manufacturing plant, should not be overlooked. There are many who act in a consulting capacity, whose technical services would probably be of greater advantage to the national government than in digging trenches or shouldering a rifle, and I believe that these men should be listed, with their professional records, so that the very best use might be made of their services in the navy yards, arsenals or other plants where mechanical skill is of the highest importance.

I would suggest to the representatives on the naval consulting board, that they consider this feature as well as that of mobilizing factories with their men and machines, so that all patriotic citizens would have the opportunity to serve their country in time of need, in a manner which would insure the greatest efficiency of the organization as a whole, and which would permit those who could not stand the rigors of active service, to perform their quota of usefulness by preparing ships, machines, etc., for those whose duty it might be to fight.

Supply Standard Fixtures

BY HAROLD V. COES

General Manager, Sentinel Mfg. Co.

ONE of the vital elements necessary for properly carrying out the plan, is for the government to construct in its own factory under its own jurisdiction, and in accordance with its own standards, the necessary jigs, templates, gages and fixtures required, and that are adaptable to special or standard machine tool equipment, and either to rent, loan or sell them to those manufacturers who are equipped and who signify their intention to manufacure shells, rifles and other war material of this character for the government.

I think there is no doubt that the British government in its present crisis would have been much further ahead with its plans if it had been able to send necessary jigs, templates, gages and fixtures to those manufacturers in this country who are making munitions of war for the British government. The jigs, tools and fixtures which rifle manufacturers in this country use were of practically little use when it came to making the Lee-Enfield; consequently it would appear extremely desirable for us to profit by this lack of foresight on the part of one of the powers now engaged in the present world war.

Prepare List of Mechanics

BY JAMES A. CAMPBELL

Mechanical Superintendent, Renfrew Mfg. Co.

MEMBERS of the American Society of Mechanical Engineers, employing collectively several thousands mechanics, could get signed statements from these men who would be willing in time of war to take positions in the large shell factories, or wherever machinists, etc., were required. These mechanics could be classed by their superintendents so that firms requiring men could see from the lists the class of men available and their experience. Committees could be formed for the drafting of these men so that there would be no loss of time in the production of munitions.

Elects New Officers

Stockholders of the Andrews & Hitchcock Iron Co., operating a blast furnace plant at Hubbard, O., recently taken over by the Youngstown Sheet & Tube Co., have elected the following officers: President, James A. Campbell; vice president, C. S. Robinson; treasurer, Richard Garlick; assistant treasurer, W. J. Morris; secretary, Henry W. Heedy; assistant secretary, William E. Manning. Mr. Campbell, who is president of the Youngstown Sheet & Tube Co., has denied rumors to the effect that the company planned to erect a plant in the Chicago district.

Mortgages on the Tower Hill Connellsville Coke Co., Uniontown, Pa., were foreclosed April 15, by Joseph Nutt and executors of the Frank Osborne estate, all of Cleveland. The petition showed outstanding and overdue unpaid bonds of $1,000,000, secured by the mortgage and accumulated interest of $100,000.

Recently appointed directors of the Gschwind Co., Youngstown, O., have elected the following officers: President, W. W. Watson; first vice president and general manager, Carl E. Gschwind; second vice president, Col. Charles F. Ritter, of Columbus, O.; secretary and treasurer, John J. Van Gorder. The company will erect a plant for the manufacture of furnaces. Mr. Van Gorder had been connected with the Carnegie Steel Co. and the Jones & Laughlin Steel Co., both of Pittsburgh.

Horton Penrose, manager of the Pittsburgh office of Shimer & Co., Inc., Philadelphia, has gone to California in the interests of the Shimer company.

Company Absorbed

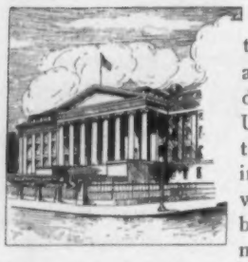
The Ohio Steel Products Co., Youngstown, recently incorporated, has absorbed the Mineral Ridge Mfg. Co., manufacturer of hoisting and haulage machines, steel tipples and mining and construction cars. Equipment will be installed for the manufacture of tubing, and a department for bending exhaust pipes will be added. Officers of the corporation are: President, A. G. Webb; vice president and treasurer, L. H. Youngs; secretary, C. R. Phillips and general superintendent, S. A. Snell.

Operating officials of the Duquesne Steel Works of the Carnegie Steel Co. attended a dinner at the Fort Pitt hotel, Pittsburgh, April 15. The guests included Homer D. Williams, president, and several other officials of the Carnegie company.

Business News of Nation's Capital

Definite Plans for Organized Industrial Preparedness—Minority of Committee Whacks Armor Plate Bill

Bureau of *The Iron Trade Review*,
206 Corcoran Bldg.,
Washington, D. C., April 18.



Practical plans to ascertain the ability of industries of the United States to be mobilized in the event of war have just been recommended to the war and navy departments by Chairman Howard E. Coffin, of the committee on production, organization, manufacture and standardization of the naval consulting board, a civil board selected at the suggestion of President Wilson, Thomas A. Edison being chairman of the board. Mr. Coffin is an engineer of the Hudson Motor Car Co., Detroit.

Mr. Coffin, speaking for the committee, recommends legislative action by congress giving the navy and war departments authority to place annual orders of $1,000 each for war munitions to manufacturers throughout the country in order to learn their ability to make munitions in time of war. In the plan, outlined to Assistant Secretary of Commerce Edwin F. Sweet, it is suggested that an order be given to every plant in the United States with a business of more than $100,000 a year. Mr. Coffin, accompanied by Roy E. Chapin, of Detroit, another member of the committee, went to the department of commerce for manufacturing statistics, and told Mr. Sweet that manufacturers already approached had agreed without exception to co-operate. Mr. Sweet immediately set the bureau of census to work to locate manufacturing plants for the board and to furnish such other information as the bureau has.

The committee has sent out letters asking the five engineering societies of the country to take immediate steps to organize state boards on industrial preparedness and urging that the meetings should be held within 10 days. The letters were sent out under date of April 8. The five engineering societies include the American Society of Mechanical Engineers, the American Institution of Mining Engineers, the American Society of Civil Engineers, the American Institution of Electrical Engineers and the American Chemical Society. Each society is to select a representative for each state to take up in a comprehensive manner the question of industrial preparedness, the plan being adopted at the suggestion of the President.

In the letter sent out, Mr. Coffin says that American engineers are to lay the cornerstone of any and every practical plan for defense, having, as they do, an intimate knowledge of the intricate detail of the industrial life of the nation. It will be the work of the engineers to marshal national manufacturing and producing reserves in support of the fighting line. Mr. Coffin points out that it is necessary to revise the entire past conception of war, and organized industry is held to be the bedrock upon which the country must build its defensive structure.

The state board of directors will be required to appoint chairmen and choose, as field aides, a sufficien. number of members of the five engineering societies in each state to secure inventories of plants, one or a specific number of establishments for each field aid. It is suggested where possible, to have field aids assigned to establishments with which they are associated. It is proposed to list and have inventoried by the aides such mines, small manufacturing establishments, etc., as would be of value in industrial preparedness, but which are not included in the list of principal manufacturers sent by the committee. The inventories are to be sent to the various state boards during May. The boards will be compelled to meet their own expense, because this cannot be done legally by the war and navy departments.

Inventory blanks sent out call for a tremendous amount of detail. They relate to such matters as the location of the plants; population of cities where they are situated; the space in the plants; whether they can be enlarged and how much; if they can be operated at night; their facilities for feeding and housing employes; the telegraph and telephone lines in the plants; how many employes are not American citizens; the units and amount of production capacity; how they are worked; labor conditions, etc. As the result of the work of the committee more than 30,000 engineers, representing every angle and phase of industrial activity within the country, have been pledged through formal and unanimous vote of their governing bodies to the work of the committee.

The first step relates to the inventory of country's producing and manufacturing resources based upon practical lines.

"Without fear of contradiction," Mr. Coffin says in his letter, "we may state that we have, at President Wilson's request, enlisted in the service of the army and navy of the United States, through co-operation with the naval consulting board, the most powerful engineering organization the world has even seen."

Strong Minority Report

Washington, April 18.—Chairman Lemuel P. Padgett of the house committee on naval affairs, has indicated to *The Iron Trade Review* that he will not bring the administration armor plate bill up in the house until after the naval appropriation bill has been passed by that body. He apparently has changed his plans, for about two weeks ago he expressed the belief that the bill would be brought up in the house under a special rule within a week or 10 days. The committee is at work on the naval appropriation bill and hopes to report it to the house soon.

It has been reported that supporters of the armor plate bill have delayed bringing it up in order to make sure of its passage and have been conducting a canvass of members to get their attitude toward the measure, and to strengthen the forces back of it. The report, however, can not be verified and probably is without foundation. Mr. Padgett has asserted that he is confident the bill will pass in the form it was when it left the senate and as it was ordered reported favorably by the committee.

The minority report on the bill shows, however, that all of the eight republican members of the committee favor the Butler amendment, defeated in committee, and will bring it up on the floor of the house. This amendment provides that the federal trade commission shall inventory the plants of the three armor-making companies

of the United States, ascertain the cost of production and then fix a fair and reasonable price for the material. The secretary of the navy would be empowered to reduce the price fixed by the commission if he concluded the figure was too high. Despite the absolute fairness to the government that this amendment would insure, administration supporters are vigorously fighting it.

Representative Fred A. Britten, Republican, of Illinois, concurred in the minority report so far as it favors the amendment, but reserved the right to vote for the bill if the amendment is defeated.

The report, said to have been prepared by Representative Patrick H. Kelley, of Michigan, is a strong document and sets forth earnest arguments against enactment of the bill. Aside from Mr. Kelley, others who signed the report include Representative Thomas S. Butler, Pennsylvania; Representative Ernest W. Roberts, Massachusetts; Representative William J. Browning, New Jersey; Representative John R. Farr, Pennsylvania, and Representative Sidney E. Mudd, Maryland.

It was asserted by the minority that a government armor plate plant would weaken by 40 per cent the military strength of the nation so far as it relates to the manufacture of armor plate. The signers of the report said that "we are more in need of a fighting navy than of a manufacturing navy." They recited how the armor making companies were encouraged to go into business at the request of the government itself, and said the plants have been closed down two-thirds of the time since they were established.

Continuing, the report says:

"The need for a government armor plant, if any exists, does not spring from a lack of facilities for the making of armor in this country. Plants now in existence are ample to take care of a building program for a navy double that of the past. If we add a government armor plant of 20,000 tons capacity, it will not be for the purpose of increasing our present facilities for making armor in the United States, but clearly for the purpose of transferring the making of armor to the government itself and immediately reducing our armor making capacity by about 40 per cent. We do not believe that this is a good time to put such a policy into execution. We should not at this time deliberately cut down our ability to make ready for an emergency quickly. Conditions are such in the world that we cannot forecast our future military needs. All our military establishments should be kept intact until world conditions become normal. Whatever we may decide eventually as to the wisdom of taking away from private enterprise the manufacture of armor and other munitions of war, we should not weaken our military situation in any direction at this time or during the years immediately following the close of the present war.

"But it is urged in behalf of this bill that these armor companies have overcharged the government in the past, and that their behavior at times has not been commendable. Whatever may be the truth as to this, it is difficult to see how they can overreach the government under the proposition they now make to enter into a contract to accept such a price for armor, in the future, as the government itself shall fix as just and reasonable."

"In conclusion," says the report, "we beg to call to the attention of the house the fact that the naval bill this year will carry an appropriation undoubtedly of more than $200,000,000. This bill appropriates $11,000,000 for an armor plate factory, of 20,000 tons capacity. The estimates for this plant were made in 1913. Since that time, labor and material have advanced in cost approximately 40 per cent. If this plant is built under present conditions, or at any time during the continuance of the war in Europe, it will probably cost the government $15,000,000. We believe that this money could be spent more wisely at this time on the navy afloat than on the navy ashore. It seems to us that we are much more in need at the present time of a 'fighting navy' than a 'manufacturing navy.' If proper provision can be made to insure a fair price for armor to the government (and the amendment above proposed will accomplish this) it seems to us that the building of an armor factory may well be deferred until we have, at least, supplied the necessary men and officers for the ships of the navy now permanently in reserve."

Regulating Ocean Traffic

Washington, April 18.—The house committee on merchant marine and fisheries probably will conclude hearings this week on the bill recently introduced by Chairman J. W. Alexander, giving to the proposed shipping board provided in the administration ship purchase bill powers to regulate ocean traffic. The jurisdiction that would rest with the shipping board in this matter would in no way conflict with that of the interstate commerce commission. Provisions of the bill are similar to those contained in the measure introduced in 1914 by Representative Alexander, enlarging the powers of the commission to give it authority to regulate rates and practices of ocean traffic engaged in by both foreign and American shipping interests. It is probable that the bill will be submitted later as an amendment to the ship purchase bill and that its supporters will make an effort to put the latter through as soon as possible, perhaps after the naval bill has been acted upon. Senator Stone of Missouri, has said that it is desired to bring up the ship purchase bill in the senate after the naval bill has been disposed of in that body, which will be subsequent to action by the house.

Eliminated from the ship purchase bill were Section 9 and 10, which related to regulatory powers of the shipping board over ocean traffic, and in their stead Mr. Alexander introduced his bill, after a conference at the White House with President Wilson, members of the interstate commerce commission and Secretary of Commerce William C. Redfield. Broadly, the powers of regulating ocean shipping rates and practices that would be conferred upon the shipping board by the Alexander bill would be similar to those now resting with the commission with regard to railroads and certain water lines.

The committee on merchant marine and fisheries, appreciating the fact that regulation of rates and practices of foreign vessels involved problems more difficult than those faced by the commission in regulating domestic rates, decided to introduce a separate bill and to hold hearings so that the views of experts might be heard. One of the principal questions disturbing the committee is as to whether the proposed authority that would be conferred upon the shipping board would contravene treaty rights.

Will Build Cars.—C. H. Todd, former president of the Petroleum Iron Works Co., and G. F. Wood-Smith, former president of the Pennsylvania Tank Car Co. and the Pennsylvania Tank Line Co., Sharon, Pa., allied interests, have purchased properties of the Masurite Explosive Co. at Masury, O. Equipment will be installed for building tank cars and the company also will engage in general plate work.

The Welsbach Co., Gloucester, N. J., has announced through General Manager Townsend W. Stites, that the employes who went on strike and returned again would not share in the 48-hour week, which went into effect on April 1. The company employes 1,400 hands.

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

H. W. Hayes, who has been made manager of sales of the Midvale Steel Co., Cambria Steel Co. and Worth Bros. Co. in New England territory, is a Cambria Steel man of long experience as a selling representative. He has been connected with the sales organization of the Cambria Steel Co. in New England territory for the past 25 years, and his long service has given him a position of prominence and wide acquaintance in that territory. Mr. Hayes is a native of New England, having been born in Cambridge, Mass. He entered the steel business in 1899 as a representative of Edw. Corning & Co., of New York, who, at that time, operated various iron and steel agencies in New England. About two years later, he became associated with the Cambria Steel Co. in a selling capacity and by gradual advancement, reached the post of district sales manager for the company. He was occupying that position when on April 1 he was appointed manager of sales for the Midvale, Cambria and Worth companies.

W. P. Snyder, president of W. P. Snyder & Co., Pittsburgh, has returned from Palm Beach, Fla., where he spent several weeks.

Thomas Dowling, formerly blast furnace superintendent of the Gulf States Steel Co., has been appointed general superintendent of the La Follette Coal & Iron Co., La Follette, Tenn.

B. Dawson Coleman, of the Pennsylvania Steel Co., Lebanon, Pa., is a candidate for delegate to the Republican national convention from the eighteenth congressional district of Pennsylvania.

H. M. Deemer has been elected secretary of the Worth Bros. Co., with headquarters in the Widener building, Philadelphia. Mr. Deemer has been secretary of the Midvale Steel Co., Philadelphia.

J. W. Deetrick, general manager of the Republic Iron & Steel Co., Youngstown, is inspecting properties of the company at Thomas, Ala. The company contemplates the erection of a battery of retort ovens at Thomas.

K. Li, of the American branch of the Wah Chang Mining & Smelting Co., Woolworth building, New York, sailed for China on April 12. He will visit the home office and plant of his company and expects to return in about three months.

Col. Henry P. Bope, vice president and general sales manager of he Carnegie Steel Co., Pittsburgh, was one of the principal speakers at the annual banquet of the Cornell Club of Western Pennsylvania, held April 8 at the University Club, Pittsburgh.

A. C. Luck, European representative of the Graton & Knight Mfg. Co., Worcester, Mass., who recently returned from a trip abroad, will leave this week for a six months' trip to South America. Mr. Luck lost his family in the LUSITANIA disaster.

H. W. HAYES

A. E. Borie, president of the Driggs-Seabury Ordnance Co., Sharon, Pa., has become director of the Finance & Trading Corporation, New York, just organized to transact a general liquidating business of assets of receiverships and other administrations.

Archibald Johnston, vice president of the Bethlehem Steel Co., was the guest of honor of the New York Alumni Association of Lehigh University at the Machinery club, Friday evening, April 7. Mr. Johnston is a graduate of mechanical engineering of Lehigh University, class of 1889.

Robert Raymond, for 36 years employed by the Holyoke Machine Co., Worcester, Mass., most of the time as superintendent of the foundry department, and Carl E. Niman, for 10 years assistant superintendent, have severed their connection with the company.

George Williamson, works manager of the Birtley Iron Co., Birtley county, Durham, Eng., has arrived in this country to return a visit paid to him by American cast iron pipe makers several years ago. The Birtley Iron Co. operates one of the leading pipe foundries of England.

Clarence K. Prince, for 26 years a heating and ventilating engineer for the H. B. Smith Co., Westfield, Mass., in addition to which he has been purchasing agent for about 20 years, has been promoted to general superintendent of the manufacturing department to succeed George H. Cushing, deceased.

Charles Bransford, formerly superintendent of the Alice furnace of the Tennessee Coal, Iron & Railroad Co. in the Birmingham district, has been appointed blast furnace superintendent of the Gulf States Steel Co., with headquarters at Alabama City, Ala. Mr. Bransford assumed his new duties on April 10.

J. G. White, of the J. G. White Corporation, has been made president by the New York section of the industrial preparedness committee of the naval consulting board. Chas. F. Rand, president of the Spanish-American Iron Co., and W. H. Marshall, president of the American Locomotive Co., are members of the committee.

E. S. Cullen, who for a number of years has been representing the Niles-Bement-Pond Co., has resigned his position and has formed the E. S. Cullen Machine Co., to engage in the sale of locomotive and shop equipment, machine tools and locomotive cranes. The offices of the company are in the Leader-News building, Cleveland.

Richard D. Murphy, formerly president of the Worcester Mfg. Co., Worcester, Mass., and for the past two years superintendent of Bethel mission in that city, has resigned to become manager of the employment department of the Wyman-Gordon Co., there. He will begin his new duties May 1, which will be in the nature of welfare work.

Charles C. Wright, manager of the steel tubing department of the Cleve-

land Tool & Supply Co., has been elected secretary of the company. In addition to his new duties Mr. Wright will still have charge of the steel tubing department, which acts as distributor for the seamless steel tubing manufactured by the National Tube Co.

J. P. McWane, president of the American Cast Iron Pipe Co., of Birmingham, Ala., has returned to this country after a several months' trip through South America, investigating trade possibilities. Mr. McWane states that there is a large and important market open to American manufacturers in South America, but that for this to be won requires adequate cultivation and development. He emphasizes the fallacy of any expectation of American manufacturers that the South American trade will be secured permanently because of the interference by the war with competition over seas. Mr. McWane decries any cock-sure attitude among business men in this country that South American business can be secured without great effort and believes that to establish themselves, the American manufacturers must deal with these buyers on the same basis as England and Germany have done in the past, which means the meeting of their own views on technical and commercial requirements.

C. W. Levalley, who has retired as president of the Chain Belt Co., Milwaukee, Wis., and has been made chairman of the board of directors, founded the company and has been its president and general manager since 1891. Mr. Levalley started the Chain Belt Co. in a small room making detachable chain belts for farm implements. Later the company branched out into making special chains, riveted roller types and gradually got into the elevating and conveying machinery business, transmission machinery and nine years ago broke into the concrete mixer field. W. C. Frye, the newly elected president of Chain Belt Co., started with this firm when about 17 or 18 years old, and has been with it for about 20 years. He is also treasurer of the Sivyer Steel Casting Co. of Milwaukee; vice president of the Federal Malleable Co., also of Milwaukee, and is a director of the new Electric Steel Casting Co., Chicago.

The officers of the company at this time are as follows: President and treasurer, W. C. Frye; first vice president and secretary, W. C. Sargent; second vice president and superintendent, Donald Fraser; third vice president, F. L. Sivyer; directors, C. R. Messinger, E. L. Wood, and the officers.

Uniform Rail Advance

Price to be Marked Up $5 Per Ton on Bessemer and Open Hearth by All Mills—Pennsy Orders

Official announcement by Chairman E. H. Gary, at New York, April 13, that the subsidiary companies of the Steel Corporation, after May 1, 1916, will quote standard steel rails on a base of $5 per ton higher, finally determined the open question of the past 10 days, as to the amount of the advance that would be adopted for their product by rail makers. On April 4 Judge Gary had announced that the rail manufacturing companies of the Steel Corporation, after May 1, 1916, would accept no more orders at present prices for rails to be delivered after May 1, 1917. The amount of the expected advance then was not determined, and this was settled upon by the Steel Corporation only within the past few days. The Lackawanna Steel Co., Pennsylvania Steel Co., Maryland Steel Co., Bethlehem Steel Co., Cambria Steel Co. and the Colorado Fuel & Iron Co., representing the independent producers, either by official statement or intimation, have expressed their intention to adopt the new prices, so that uniform quotations for rails on the higher basis are practically assured.

Railroads Not Complaining

New York, April 17.—Some of the leading railroad executives in this city express little opposing sentiment or regret over the advance in steel rail prices made by the important producers. They declare they have been surprised that the advance has not come sooner, in view of the changes that have been gradually evolved in the cost of manufacture of rails and especially in view of the extraordinary market conditions that now prevail. J. J. Hill is reported to have told rail makers before the advance was announced, that with higher rail prices and increased labor costs, many of the roads would refrain from buying large tonnages until after the war, when it was believed the regime of present high steel prices would have been passed and something like the old quotations would be restored.

The advance in the official base places standard open hearth rails at $35, mill, and standard bessemer at $33, mill, thus terminating the unbroken line of rail prices which has stood since May, 1901. It has been apparent for some time that the present quotations of $28 for bessemer, and $30 for open hearth, have completely ignored the steady increase in manufacturing costs that had come about during the past 15 years, or since these prices originally were established, because of improved specification, higher wages and raw materials, greater outlays for new construction and plant upkeep, etc. When the phenomenal steel market now prevailing has been considered, it has been manifest that the raw steel which has gone into rails has required a sacrifice of value on the part of the makers that has disregarded supply and demand and has been out of all proportion to the equities of the case.

Prices of bessemer rails since 1886, as shown by the statistics of the American Iron and Steel Institute and by other sources, are given as follows: 1886, 34.52; 1887, 37.08; 1888, 29.83; 1889, 29.25; 1890, 31.78; 1891, 29.92; 1892, 30; 1893, 28.12; 1894, 24; 1895, 24.33; 1896, 28; 1897, 18.75; 1898, 17.62; 1899, 28.12; 1900, 32.29; 1901, 27.33.

The production of rails from 1897 to 1915 are as follows:

Years.	Open hearth.	Bessemer.
1897	500	1,644,520
1898	1,220	1,976,702
1899	523	2,270,585
1900	1,333	2,383,654
1901	2,093	2,870,816
1902	6,029	2,935,392
1903	45,054	2,946,756
1904	145,883	2,137,957
1905	183,264	3,192,347
1906	186,413	3,791,459
1907	252,704	3,380,025
1908	571,791	1,349,153
1909	1,256,674	1,767,171
1910	1,751,359	1,884,442
1911	1,676,923	1,053,420
1912	2,105,144	1,099,926
1913	2,527,710	817,591
1914	1,525,851	323,897
1915	1,775,168	326,952

Since 1901, the $28 price for bessemer and $30 for open hearth has remained unchanged until the present date.

What the $5 advance means to the buyers of rails is apparent from the accompanying table of annual production since 1897.

Pennsylvania Orders Rails

Following quickly upon the announcement that prices were to be advanced May 1, action has been taken by the Pennsylvania railroad on its 1917 requirements, which had been pending for several weeks. This system announced it has placed orders for 205,000 tons, of which 125,-

000 tons are for the lines east and 80,000 tons for the lines west, which will include a large portion of 130-pound rails. It is the understanding that the business was entered by makers on the old basis of prices. The division of the tonnage among the Steel Corporation mills, the Lackawanna Steel Co., Cambria Steel Co., Bethlehem Steel Co. and Pennsylvania Steel Co. has not been announced. The Pennsylvania order is one of the largest ever placed by that system. In 1915, the total was 167,500 tons.

Machinery Men Organizing

Chicago, April 18.—Machinery and supply men of Chicago are organizing a club along similar lines to those in existence in New York and other large cities. A preliminary meeting was held Monday, April 10, and steps were taken to formulate bylaws and a constitution which will be presented at a later meeting for permanent organization. The tentative membership is satisfactorily representative and it is believed a large number not now interested will become members as soon as the club is on an actual basis.

Still Expanding

The National Tube Co., Pittsburgh, which completed plans last summer for an addition to its Christy Park works at McKeesport, Pa., continues to carry out its program of extension. The city council at McKeesport recently voted to vacate 13 streets, covering about six acres, which will be utilized by the National company. Details of the proposed increase in capacity have not been announced.

Takes Over Shops

The Locomotive Stoker Co., organized to manufacture a device for automatically firing locomotives with coal, has taken over shops at one time occupied by the Westinghouse Air Brake Co., on the North Side, Pittsburgh. The Stoker company was organized three years ago, as a subsidiary of the Westinghouse Air Brake Co. The officers of the company are: W. S. Bartholomew, president; A. L. Humphrey, vice president; Clement F. Street, vice president; F. L. Wassell, secretary; P. W. Lander, treasurer, and J. H. Eicher, auditor.

The Aluminum Co. of America, Pittsburgh, is preparing plans for a club house, to be erected at New Kensington, Pa., for the use of officials and skilled employes of the company. The building will be 75 x 200 feet.

Colonel Bope

Will Delivery Address of Welcome to Delegates to Triple Convention

The Pittsburgh convention committee in charge of the triple joint convention of the Southern Supply and Machinery Dealers' Association, the National Supply and Machinery Dealers' Association, and the American Supply and Machinery Manufacturers' Association, to be held at the William Penn hotel, May 10, 11 and 12, and the annual convention of the American Iron, Steel and Heavy Hardware Association, to be held at the same hotel, May 24, 25 and 26, has adopted tentative programs. On the opening day, addresses of welcome will be made by Col. H. P. Bope, vice president of the Carnegie Steel Co., representing the manufacturing interests; Robert Garland, councilman, representing the civic interests, and Frank J. Lanahan, head of the Fort Pitt Malleable Iron Co., representing the chamber of commerce of Pittsburgh. Each organization will hold a business session in the afternoon. A reception and ball will be enjoyed in the evening.

The following morning will be devoted to the transaction of general business. The H. J. Heinz Co. plant will be visited by the ladies attending the convention. A vaudeville dinner will feature the evening's entertainment.

On Friday morning, May 12, trips will be taken to some of the larger manufacturing plants in the Greater Pittsburgh district. The ladies will be entertained at the Pittsburgh Country Club in the afternoon. A "stirup cup supper" will be given in the evening.

Similar entertainment features have been arranged for members of the American Iron, Steel and Heavy Hardware Association, which will open its convention May 24.

Reports Year's Earnings

The National Steel Car Co., Montreal, with plant in Hamilton, Ont., reports earnings for the year ended Nov. 30, 1915, of $737,871, which compares with a deficit of $6,680 in 1914 and earnings of $243,228 in 1913. After repairs, renewals and other charges, the net profits for the year were $446,719. The directors of the company state that orders on books amount to about $10,000,000, and that on this account arrangements for special financing already have been made. Most of the present unfilled munition business consists of repeat orders, the first orders from the British and French governments having been filled satisfactorily. Dividends accrued on preferred stock on Dec. 1 last amounted to 21 per cent and the directors recently decided to pay 7 per cent for 1916. The back dividends call for $315,000, which would leave $131,719 applicable to the common stock, but the directors plan to use all earnings of last year as working capital. The income account compares as follows:

	1915.	1914.
Earnings	$737,871	*$6,680
Repairs & renewals	163,651	36,688
Reserve for depreciation	127,500	33,000
Profits after charges	446,719	.....
For'd from prev. year	80,785	157,153
Surplus	527,504	†80,785

*Deficit. †Balance from previous year.

Increases Capital Stock

Stockholders of the Hydraulic Pressed Steel Co., Cleveland, at a special meeting Wednesday, authorized an increase in common stock from $1,000,000 to $1,500,000. Directors declared a stock dividend of 50 per cent, payable to stock of record April 20. Officials state that slightly over 60 per cent of the outstanding stock has been optioned to Vice President James H. Foster at $540 a share on the $1,000,000 basis, or at $360 a share on the $1,500,000 basis. An eastern syndicate has been formed to take over the control of the company. It is said that an unnamed steel company with plants in the Pittsburgh district will absorb the company and give the Hydraulic its raw material directly.

Indianapolis, Ind., April 17. — Judge Albert B. Anderson of federal court today granted a permanent injunction against the Hammond, Ind., local lodge, No. 209, machinists, and 58 additional defendants, which was sought by the Edwards Valve Mfg. Co., East Chicago, as the result of a strike at the company's plant in January when one man was killed and several injured.

The court's decree stipulates that the costs shall be paid by the defendants, and that the court retains jurisdiction in the case. When argument was heard on application for a temporary injunction, counsel for the defendant argued that the federal court had no jurisdiction in the case, and attempted to show that violence had been committed by the strikebreakers instead of the strikers. A temporary injunction had been granted the day after the walk out at the East Chicago plant.

Joseph A. Sedwick, secretary and treasurer of the Fore River Ship Building Corporation, died at his home in Quincy, Mass., April 14.

Iron and Money: Fact and Comment

Lackawanna Steel Co. Makes Splendid Showing—Some Interesting Observations on Finances After the War

A REMARKABLY favorable showing of earnings is given by the Lackawanna Steel Co. in its report for the first quarter of 1916, which is the first financial exhibit of any of the larger steel producers for any period of the current year. First quarter profits were $2,251,068, compared with $1,795,758 in the fourth quarter; $910,724 in the third quarter; $268,384 in the second quarter and a deficit of $565,769 in the corresponding quarter of 1915. The earnings for the past six months were at the annual rate of 25.9 per cent on the $34,750,000 common stock outstanding.

The income account for the first quarters of 1916 and 1915 compares as follows:

	1916.	1915.
Total net earn. after ordinary rep'rs and main. but not renewals.....	$3,247,593	$199,843
Int., bonds, debentures and notes	402,500	425,783
Subsid. bonds, etc.....	76,662	77,475
Rentals and royalties...	25,459	25,459
	$504,621	$528,717
Balance	2,742,971	*328,873
Extinguishment mines & mining investments....	71,792	32,506
Depreciation and renew.	420,111	204,379
	$491,903	$236,885
Profit	$2,251,068	*$565,758

*Deficit.

A continued increase in the unfilled orders of the Lackawanna Steel Co., which recently have been at a very high volume, is shown. On March 31, there were 871,876 tons on the books, a gain of 59,196 tons over Dec. 31. A statement of unfilled tonnages at the close of each quarter in recent years follows:

Mar. 31, 1916.....	871,876
Dec. 31, 1915.....	812,680
Sep. 30, 1915.....	393,084
June 30, 1915.....	283,979
Mar. 31, 1915.....	229,910
Dec. 31, 1914.....	160,160
Sep. 30, 1914.....	166,344

Post Bellum Finances

Edward R. Stettinius, chief of the export department of J. P. Morgan & Co., on his return April 14 from a trip abroad, stated that few new large orders for munitions now are being placed in this country, as the plants in England and France have been brought to so high a stage of production that these countries now largely are independent of the United States. Exports now going out are the result mainly of orders given some time ago. Discussing the situation abroad, Mr. Stettinius said:

"The rumor published here, that I am bringing over pockets full of new orders are not founded on fact. Orders for war supplies are not handled in that way. My knowledge of the way in which munitions are being turned out from the factories is what makes me smile at the talk of my pockets being full of orders. There will be no difficulty, so far as I can see, about financing, either during the war, nor after. There is a great deal of undiscovered wealth in France yet. The peasants have got a great deal of money stored away which will be forthcoming when needed. I do not care to discuss the financial load which England may have to carry for the allies; that is a phase of the proposition to which I have not given consideration.

"Most of the reconstruction of the European countries now at war will be done by themselves when the war is ended. Many of the large factories which have sprung up for production of war munitions will be utilized for other purposes when the war is over. Many of the men returning from the front will have to be given employment, and for this reason I do not anticipate any great influx of business to this country in what may be termed the reconstruction of the countries now at war."

Buys California Company

The Simmons Co., Kenosha, Wis., formerly Simmons Mfg. Co., one of the largest manufacturers of metal beds and springs in the world, has made formal announcement of the purchase of the business of the Rudgear-Marle Co., San Francisco, which is considered the largest competitor of the Simmons company in the west. The purchase price is not made public, but is said to be $2,000,000. Andrew Rudgear, president of the San Francisco company, has been elected vice president of the Simmons company and appointed general manager of the Pacific coast division. L. C. Lance, formerly western manager for the Kenosha concern, is made treasurer of the division. It is stated that contracts have been awarded for the installation of approximately $100,000 worth of new tools and other machinery in the works at San Francisco.

Financial Notes

The Toledo Machine & Tool Co., Toledo, O., has increased its capital stock from $1,200,000 to $3,000,000.

The Alemite Metals Co., Chicago, has increased its capital stock from $25,000 to $50,000.

The W. H. Hobbs Supply Co., Eau Claire, Wis., manufacturer of hardware and plumbing specialties, has increased its capital stock from $60,000 to $100,000.

Harris Brothers & Co., of Chicago, have bought the machinery and equipment of the Racine Boat Mfg. Co. from the Michigan Trust Co. for approximately $100,000. This concern has been in the hands of receivers for some time.

Since its fiscal year closed the National Steel Car Co., Hamilton, Ont., has increased its orders of rolling stock to be used on foreign railways by some $2,000,000. The report issued April 11 gives orders booked at $10,000,000. In a note to shareholders on Dec. 1, in connection with the financial plan then announced, General Manager Basil Mavor estimated orders at $8,000,000. The company is operating now on repeat orders from foreign governments, and is said to be making a considerable saving on rejects.

Permanent organization of the Vulcan Brake Shoe & Equipment Co., recently incorporated in Delaware with a capital of $1,000,000, is about to be made. W. H. McDonough, it is said, will be chosen president. Raymond M. Brower and Edward Barrett Smith, formerly in charge of the sales department of the American Brake Shoe & Foundry Co., will be vice presidents. F. W. Grant, formerly assistant to the vice president of the American Brake Shoe & Foundry Co., will be secretary. R. N. Hill will be engineer of tests. Plants are to be established in the east.

The Keighley Mfg. Co., Pittsburgh, manufacturer of metal lockers, recently has moved its offices from the Keystone building to its warehouse building, 124 Third avenue, Pittsburgh.

News of Employers and Employes

Numerous Labor Troubles in New England—Bridgeport Strikers Are Enjoined—Wages Advanced at Youngstown

MASSACHUSETTS and Connecticut are still the center of labor troubles in New England, with the nutmeg state in the lead. In addition to the plant of the Hendey Machine Co., Torrington, Conn., employing more than 900 hands being closed, the most serious trouble is at the works of the American Graphophone Co., in Bridgeport, Conn., where about 1,000 employes are out. It started with a strike of 378 night workers, including pressmen, helpers, sweepers and others, April 12, and the next morning the day workers in the same department, 400 strong, walked out, followed later in the day by 178 girls quitting. The strikers are to make a demand for an increase in wages from 34 to 40 cents an hour, the straight 8-hour day, time and one-half for overtime, abolition of the bonus system as now in vogue, recognition of the union and reinstatement of men alleged to have been discharged because of union activities. The night workers claim they have been working 11½ hours and did not get any overtime pay. The company is hiring men to take the place of the strikers.

Fifty men employed as assemblers at the east armory of the Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., struck last week because a demand for 45 cents an hour was not granted by the company. The strike is not the result of any activity on the part of labor organizations, as the men were unorganized.

N. M. T. A. Covention

The following program has been announced by the National Metal Trades Association for its annual meeting at the Hotel Astor, New York, April 27-28. As stated previously, the usual program of papers has been omitted to allow full discussion of the labor situation as it has developed during the past year.

The program in full is as follows:

Thursday Morning 9:30 o'clock.

Appointment of convention committees.

Reports of officers: Herbert H. Rice, president; Frank C. Caldwell, treasurer; John D. Hibbard, commissioner; Homer D. Sayre, secretary.

Reports of standing committees and discussion: Industrial education, F. A. Geier; apprenticeship, W. A. Viall; membership, J. W. O'Leary; prevention of industrial accidents, W. H. Van Dervoort.

New business.

Buffet luncheon.

Thursday Afternoon, 2 O'clock.

Experience meeting.

Thursday Evening 7 O'clock.

Convention banquet.

Friday Morning 9:30 O'clock.

Work of conference board, M. W. Alexander.

Industrial Preparedness, James M. Emery.

Reports of convention committees.

Report of nominating committee, F. C. Caldwell, chairman.

Election of officers.

Adjournment at noon.

Union Permanently Enjoined

Judge Edwin B. Gager, of the superior court in Bridgeport, Conn., has granted a restraining order enjoining the strikers of the Max Ams Machine Co., in Fairfield, Conn., from picketing the factory and from annoying, intimidating or in any way interfering with the employes of the company or those seeking work there. The injunction, issued on petition of the company, places the strikers under $1,000 bonds to observe its provisions. The International Association of Machinists is to fight the Ams Co. in the courts, and has ordered Frank L. Mulholland, Toledo, O., to Bridgeport as a result of Judge Gager's decision. Despite the fact that the pickets have been withdrawn in obedience of the decision, the company is maintaining its force of guards at the plant and will continue to do so for a month. Mr. Mulholland is one of the lawyers who defended the Danbury hatters in the recent boycott case and is known nationally as counsel for labor organizations.

Labor Notes

Employes of the A. & F. Brown Co., Elizabeth, N. J., machinery manufacturer, have received an increase of 15 cents a day.

Employes of the American Ammunition Co., Paulsboro, N. J., went on strike because of the refusal to grant more pay, the men claiming that the work is too dangerous for the salary paid.

The Ulster Iron works at Dover, N. J., has resumed operation again after having been closed because of a strike. The men wanted an increase of 25 cents a day and the company refused to grant it.

Molders of the Davis & Furber Machine Co., Lawrence, Mass., have demanded an increase of 10 per cent, instead of 5, which was offered them, and also have asked that they be given a half holiday on Saturday.

After having been closed down since March 20 because of a strike of 500 employes the Waclark Wire Co., Bayway, N. J., has resumed operations. The men asked for an increase of 50 cents a day for nine hours or an increase of 25 cents and a reduction of hours. The company refused to announce the terms of agreement.

Steps are being taken to obtain better working conditions for the machinists in the factories of the Automatic Machine Co., Ashcroft Mfg. Co., the Standard Mfg. Co., and the Baird Machine Co., all in Bridgeport. The first two are on a nine-hour basis, the Standard eight and the Baird 10 hours. The men want more money in each shop.

One hundred and fifty employes of the New England Westinghouse Co.'s East Springfield, Mass., plant struck last week for higher wages. They claim they have been receiving 23 cents an hour for work in the drill room, although in other places they claim men performing the same kind of labor get 43 cents an hour, while others are paid $4 a day. Officials of the company claim that the men cannot be classed as skilled labor and the company, therefore, cannot see its way clear to make an advance.

The Stover Engine Works and the Stover Mfg. Co., Freeport, Ill., are being merged and become the Stover Mfg. & Engine Co., with a capital of $3,000,000. The stock is to be underwritten by a number of Chicago bond houses.

Spang & Co., Butler, Pa., manufacturers of gas engines and oil well supplies, have received a rush order for 50,000 6-inch shell cartridges for the British government, through a sub-contract. The company started to ship material March 20.

Ore Movement to be 53 Million Tons

Estimated Shipments this Year from Lake Superior District Will Set Record—

An Analysis of the Situation on Lakes as Season Opens

THE steady disintegration of the ice on the Great Lakes during the past few days will release the great fleet of ore carriers somewhat earlier than expected. Ice conditions have been unusually bad this spring and a few weeks ago it was confidently predicted that few boats would reach the head of the lakes from Lakes Erie and Michigan before May 1. Warm rains, however, have melted the ice in many places while at the Soo and in Escanaba harbor, chartered ice breakers have been at work.

The 1916 season on the Great Lakes threatens to be the heaviest in the history, but paradoxically it is practically certain that the tonnage moved will fall short of the requirements. This great fleet that has given the ore, coal and grain interests of the country such splendid service at a comparatively low freight rate, in 1916 will be the neck of the bottle. The enormous demands of the iron and steel industry, of the coal-consuming interests of the north and of the grain buyers of Europe, far outstrip the maximum capacity of the fleet.

This impending scarcity of tonnage is also directly responsible for another paradox. With the blast furnaces of Illinois, Indiana, Ohio, Pennsylvania and New York consuming ore at the greatest rate in history and in the face of the largest prospective ore movement on record, some mines in the Lake Superior district are being closed down and mining organizations broken up.

Many ore producers are trying to sell ore. Many ore consumers are trying to buy ore. But their efforts to establish a common trading basis are blocked by the all-important question of getting the ships to carry the ore. The mining or blast furnace interests without vessel arrangements, who have endeavored to sell or buy ore during the past few weeks, have met little encouragement.

This condition does not mean that the number of mines which are shutting down is large, or that the furnaces hampered by insufficient ore supplies are numerous. But it is true that the Great Lakes fleet will not be able to carry all the ore that could be mined and sold and as a result some mines and furnaces will suffer.

One mining expert from Minnesota informed *The Iron Trade Review* a few days ago that more than 8,000,000 tons of "independent" ore which was already stockpiled and ready for shipment, would not be forwarded this year owing to lack of tonnage. By "independent", this expert referred to ore controlled by mining companies with no blast furnace connections. Numerous cases are known of mining companies on both the Minnesota and old ranges, who have from 50,000 to 250,000 tons of ore ready for loading into cars, and can not sell their ore.

This condition has attracted fancy rates on ore. The bulk of the season's movement, was of course closed shortly after ore prices were fixed and rates established last winter. For the few cargoes still available, vessel interests are asking rates 200 per cent and more, above the fixed tariff. One interest is asking $1.25 on ore from Escanaba to Lake Erie. Many shippers have bid $0.95 and $1 without result.

A careful survey of the lake situation strengthens the belief that the ore movement this year, even under favorable conditions, will probably not exceed 53,000,000 tons. Some estimates are below this figure, while others predict that 55,000,000 to 56,000,000 tons will be moved. The lake fleet has never moved 50,000,000 tons of ore in one season, although the 1913 and 1915 records only barely fell short of this figure. The fleet has not been enlarged materially since that time, no ore carriers being built in 1915. Seven ore carriers are expected to be launched this year, but this addition is offset by the sales of lake boats for ocean service. While these vessels are small, some of them carried ore and in any event this lost tonnage must be recovered by inroads upon other vessels, with resultant loss in the ore-carrying capacity.

Every available vessel on the lakes is being pressed into service and the full fleet will be running from the time the ice goes out until December, according to plans of the vessel interests. Two disturbing factors, however, enter into the situation, the full effects of which cannot be determined at present. These elements are the possibility of car shortages at lower lake ports, and the restrictive requirements imposed by the LaFollette seamen's law. Of these, the car situation will not be disclosed until actual shipping begins. Last year dispatch from docks was excellent, but the railroads at that time were handling only a fractional part of the freight that is clogging their tracks today. The next few months will disclose their ability to meet the additional burdens of a record-breaking ore movement.

The restrictive action of the seamen's law, however, is an immediate factor. This act requires that 40 per cent of the deck crews of all vessels must carry certificates. To secure these certificates, a seaman must have

Ore Consumption Heavy

Figures compiled from records of The Iron Trade Review disclose the interesting fact that the consumption of Lake Superior ore by the blast furnaces of the country during the first quarter of this year, was close to 14,000,000 tons. During this quarter, blast furnaces were operating at a high rate and there is little likelihood of any decline in this rate of ore consumption for some time ahead. The stacks that will be put out for relining will be offset to a large extent by the additional furnaces that are being prepared for the torch.

On this basis, the consumption of Lake Superior ore during the next 12 months will be 56,000,000 tons, a huge volume that will tax the transportation facilities of the Great Lakes to their utmost.

Synopsis of Conditions on Great Lakes

Every available vessel is being made ready for service.

Ore shipments will probably be about 53,000,000 tons.

Freight rates on ore have mounted steadily.

Some mines without vessel arrangements are shutting down.

These mines are unable to sell their ore although consumers are anxious to buy. Lack of vessel tonnage causes this condition.

The requirements of the LaFollette seamen's law concerning certificated seamen is disturbing factor.

Ability of railroads to move ore freely from lower lake docks is questioned.

Dock balances on May 1 will be lowest in nine years.

Vessel capacity is insufficient to meet requirements.

served on the Great Lakes for 18 months, or three seasons, and must pass a physical and mental examination. The deck crew of the large ore carriers numbers 11, so that four or five of the deck hands on each vessel must have certificates.

A conservative survey shows that 4,500 of these "certificated" seamen will be required. A few days ago, the number of such certificates issued by government inspectors was only 2,500, leaving an apparent shortage of 2,000 certificate-carrying seamen with the opening of navigation only a few days away. Under the present construction of the law, no vessel can leave any port of the United States without its quota of these "certificated" seamen. While the seriousness of this situation is easily over-emphasized, yet there is no disputing its importance. If enough men cannot be found, the government may let down the bars and thus avoid the appearance of seriously constricting trade. Even if the law's effects can be confined to holding up some vessels for only a few days, the result on lake trade will be far reaching. A short delay to only a part of the fleet is equivalent to lopping off a million tons from the season's movement.

Lower lake ports will hold a smaller balance on May 1 than on any corresponding date since 1907. Shipments to interior furnaces during the winter have been exceptionally heavy and some stock piles have been cleared away that have stood for 15 years or more. Some of this ore has been shipped from dock, not to meet furnace requirements, but to clear the docks for receiving ore to better advantage during this summer. The furnace interests have seized the opportunity to move the ore now, rather than risk the possibility of car shortages later in the season.

Preparing to Expand

The Hilles & Jones Co., Wilmington, Del., manufacturer of punching and shearing machinery, has purchased the old rolling mills adjoining its property, which originally belonged to the Seidel & Hastings Co., and later was operated by the Keystone Steel Co. The old buildings are now being razed to provide space for the future developments of the Hilles & Jones business. The acquired site is 514 x 352 feet.

Not Abandoned.—Official denial is given to reports which recently have been current to the effect that the United States Steel Corporation had abandoned its plans to erect a large new plant at Ojibway, Ont.

Chromic Ore

Production Largely Increased in the United States

According to J. S. Diller, of the United States geological survey, whose report is now in press, the chromic iron ore marketed in 1915 amounted to 3,281 long tons, valued at $36,744. In 1914 only 591 long tons, valued at $8,715, was sold. Mr. Diller says:

"Chromium is a metal which when alloyed with steel gives to it hardness and toughness that makes it useful in the manufacture of automobile steels, armor plate, armor-piercing projectiles, the shoes and dies of stamp mills, and tires for rolls used in crushing ores, tool steels, and in other steels to which it is desired to give hardness and toughness. The huge orders placed in this country for war materials have not only resulted in a great demand for chromium steels to be used directly for purposes of war, but have led to the increased manufacture of special steels for cutting shells, rifle barrels and other instruments of war, and are reflected in increased metal mining and greater consequent use of chromium steels for crushing machinery.

"Practically the only mineral used as a source of chromium is chromic iron ore, known as chromite. Chromite is largely imported, but importations have been much interrupted by the war, and as a result the production of chromic iron in the United States was last year greatly increased. Unfortunately for the consumers, nearly all of whom are east of the Mississippi, the production in the United States is wholly in California, and to reach the greater market it has to be transported across the Rocky Mountains and Great Plains. At the end of the long haul, under ordinary conditions, it must compete with imported ore. However, there has been a sufficient decrease in freight rates to encourage production, and this with the irregularity of imports greatly encouraged the mining of the California ore in 1915."

Agency Contract

Washington, April 18.—A jobber of iron pipe, who had made application for a complaint by the federal trade commission for violation of Section 2 of the Clayton act upon the allegation that a manufacturer of such pipe discriminates in prices of such product in favor of a large jobber has been advised that the case he mentioned does not come within the provisions of the section named.

"Upon investigation of such charges," the commission held in its conference ruling, "it appears that such jobber sells the product of the manufacturer at prices fixed by the manufacturer under a contract of agency on a commission." The commission therefore held that as the contract is not one of sale, but of agency, it did not come within the provisions of Section 2 of the Clayton act.

Will Not Build

Judge Gary has denied a report that an option had been taken on the property of the American Bank Note Co., on Greenwich street, in the rear of Old Trinity, New York City, and that a large office building, to be used exclusively for its own purposes, would be erected by the Steel Corporation. The report that the Steel Corporation would erect an office building in New York has bobbed up periodically for several years past, but each time it has proved to be unfounded.

Will Operate Furnaces

The mines and blast furnaces of the Atikokan Iron Co., Fort William, will be running at full blast this summer. On account of difficulties in the treatment of the ore it was found necessary to close the plant a few years ago, but a way of getting rid of the surplus has been found and operations will very shortly be resumed. A large force of men has left Fort William for the mines at Atikokan, 135 miles west of the city, to begin the extraction of ore.

The Minnesota Testing Laboratories, Inc., Duluth, Minn., has opened a general testing bureau in the Glencoe building, that city. The new corporation represents a coalition of the Lake Superior interests of Crowell & Murray, Lerch Bros. and the Duluth Testing Laboratory. The work to be undertaken will be general testing along the lines of metallurgical, chemical and industrial engineering in their various phases.

The Providence Association of Mechanical Engineers, Providence, R. I., is planning to hold an engineers' dinner May 3, at which time the proposition for forming the Providence engineering society will be presented.

W. H. Lewis, until a few years ago superintendent of the Aliquippa works of the Jones & Laughlin Steel Co., Aliquippa, Pa., now is vice president and a director of the Heppenstall Forge & Knife Co., Pittsburgh.

Favor Bill to Eliminate Efficiency

House Committee Expected to Approve Tavenner Bill Prohibiting Scientific Management in Government Shops

PREPARATION of the report on the Tavener bill, prohibiting scientific shop management in government establishments, has been left by the house committee on labor to Representative Edward Keating, democrat, of Colorado. Mr. Keating, like most, if not all, of the other members of the committee, is strongly in favor of the measure, and the fact that the work of preparing the report was assigned to him, denotes plainly that the committee will urge passage of the measure. Mr. Keating told *The Iron Trade Review* that he did not know when he would be ready to make the report. He stated that he has a great amount of other work on hand, and had tried unsuccessfully to have the committee relieve him of this new task. It is improbable that the bill will be reconsidered. The committee meets regularly every Thursday, but the bill has not been discussed since hearings on it closed week before last. At that time manufacturing interests, efficiency engineers and representatives of organized labor were granted a hearing. The committee may or may not take final action on the bill on Thursday of this week, but in any event, this action promises to be a mere formality, and a reiteration of the committee's previous action in ordering a favorable report. The committee's perfunctory manner of conducting the second hearing gave little encouragement to those opposed to the bill.

"So far as I can learn," said Mr. Keating, "there is not the slightest desire on the part of the committee to reconsider its position. The hearings granted opponents of the measure, instead of changing my attitude toward it, have strengthened my belief that it ought to be enacted, and I paid particular attention to the testimony they gave. The hearings were entirely irregular and were granted for the purpose of gratifying Emery (James A. Emery, counsel for the National Association of Manufacturers). Had these hearings been allowed by a committee appointed by Cannon (Representative Cannon of Illinois), the labor organizations would have yelled their heads off. The chairman of the committee (Representative Lewis, of Maryland, supporter of the measure), granted the hearings without authority. There was no quorum of the committee present at any of the hearings, and they could have been prevented if any member of the committee had raised a point of no quorum. But we were anxious to give opponents of the bill their day in court, so the hearings were held.

"The bill had already been ordered reported favorably, and the next regular thing in the procedure to be followed was to submit a report and let the house vote on the bill. But instead of this, the hearings were held. There has been no hearings previous to those granted opponents of the bill. The report that the committee held hearings in executive session for the benefit of Representative Tavenner of Illinois, author of the bill, and President N. P. Alifas of the machinists' union, is not true. One day the committee was waiting for a quorum, and while sitting in the committee room, Mr. Tavenner and Mr. Alifas came in and talked with members of the committee about the bill. I came in just as Mr. Alifas was concluding his talk. The talks were informal in every respect and were not in the nature of hearings at all."

Mr. Keating's statement shows that the committee, at least, acted arbitrarily and proceeded to order a favorable report on the bill before opponents of the measure even knew it was being considered.

The only changes made by the committee in the bill as prepared by Mr. Tavenner involved elimination of the preamble, substitution of the word "system" for "device" where a reference is made to prohibition of time studies, and addition of the words "for the purpose of fixing a standard of service requirements for such employes" after the word "work" where reference is made to the prohibition of time studies of movements of employes.

Mr. Keating said that the preamble probably would have been stricken out on the floor in any event and that it is only argumentative, and has no bearing in the legislative way. He referred to the preamble as "Mr. Tavener's little speech." The word "system," instead of the word "device," Mr. Keating thought, liberalized the measure somewhat, but not much, and he has a similar opinion as to the third change. With the word "system" used, the bill prohibits the use of "other time measuring system," rather than of "other time measuring device," so that one with a vivid imagination may invent a way of standardizing work by use of a device, without adopting a system. The added words "for the purpose of fixing a standard service requirement for such employes" apparently is designed to make the measure more specific, if possible.

The bill in its present form, therefore, and the shape in which it will go to the house floor, in all probability, reads as follows:

"Be it enacted by the senate and house of representatives of the United States of America in congress assembled,

"That it shall be unlawful for any officer, manager, superintendent, foreman, or other person having charge of the work of any employe of the United States government to make or cause to be made with a stop watch or other time-measure system (substituted for word device) a time study of any job of any such employe between the starting and completion thereof, or of the movements of any such employe while engaged upon such work, for the purpose of fixing a standard of service requirements for such employes. (Last 13 words added). No premiums or bonus or cash reward shall be paid to any employe in addition to his regular wages, except for suggestions resulting in improvement or economy in the operation of any government plant.

"Sec. 2. That any violations of the provisions of this act shall be deemed a misdemeanor and shall be punished by a fine of not more than $500 or by imprisonment of not more than six months, at the discretion of the court."

Hodges Named

Chicago, April 18. — George Hodges has been named by the American Railway Association to succeed Arthur Hale as chairman of the committee on relations between railroads. Mr. Hale recently resigned this position to enter other employment in the east. This committee has to do with 403 railroads operating 294,000 miles of track in the United States, Canada and Mexico and also looks after relations between the railroads and shippers. Mr. Hodges began his railroad work with the Erie railroad in Cleveland in 1886.

Home Tool Market Mounts Skyward

Foreign Inquiry Continues Strong But Domestic Buying Takes the Lead—
Railroads Play Major Role in Tool Circles

INQUIRY for machine tools and general equipment continues of large and sustained proportions in the east. The past week has been characterized by improvement on the part of the railroads, an increased activity in the foreign demand, and by a more insistent call from domestic concerns for large-swing lathes and other equipment to manufacture 9.2-inch shells. One of the biggest buyers of equipment for this purpose is the American Steel Foundries, while several other American and a number of Canadian concerns are in the market for such machinery. The export demand, naturally, is not nearly in as large proportions as last year, but appears to be considerably more active than in the last few weeks. Good-sized orders have been placed during the week for shipment to Russia, Portugal, Italy and England. A good-sized miscellaneous business is being booked for Chile, the Argentine republic and other South American countries, and one seller reports that for the first time in a long while he has booked some good business for Cuba.

New York Central Distributes List

CURRENT railroad buying is of large proportions, and is being participated in by a larger number of roads than usual. The most important buying reported probably is that by the New York Central, which road has started to distribute the large list on which it took bids several months ago. It is not known whether the entire list will be closed at this time; a number of the more important tools involved, however, were placed during the week. The Midland Valley railroad, with headquarters in Muskogee, Okla., also has begun the distribution of the list which was published in last week's issue of *The Iron Trade Review;* at least a number of the tools have been placed and it is considered likely the entire list will be closed immediately. Arnold & Co., Chicago, the engineers for the shops of the Norfolk & Southern railroad, already have placed orders for a few tools for these shops, and are expected to place the remainder without delay. The Baltimore & Ohio, which has been a steady purchaser of late, has placed some additional orders. The Pennsylvania railroad also has distributed business involving a comparatively large total. A number of eastern roads have put out new inquiries but none of these involves more than a few tools each; one of these was issued by the Erie railroad. It now is expected that the major part of the machine tool equipment for the large new shops of the Chicago, Burlington & Quincy railroad at Burlington, Ia., will be bought by the engineers, Westinghouse, Church, Kerr & Co., 37 Wall street, New York; the latter concern, as reported last week, is taking bids on 10 large cranes for these shops.

An important feature of the week was the placing of an order for a car dumper by the Erie railroad. This dumper will be erected by the McMyler Interstate Co., Bedford, O., at Edgewater, N. J. The Philadelphia & Reading railroad is about to let a contract for one or two car dumpers to be installed at Port Reading, N. J.

Demand for equipment for making time fuses continues an important feature of the eastern market. The Keystone Watch Case Co., Riverside, N. J., has closed for a large number of machines for this purpose. The Neptune Meter Co., Long Island City, through its subsidiary, the Liberty Arms & Fuse Co., continues an important buyer of such equipme The Splitdorf Electrical Co., Newark, N. J., has begun buying machine tools for a large factory building which it is about to erect. The Murray Hill vocational school, New York City, which recently took bids on a number of machine tools, including two lathes, two grinders, speed lathes and power hack saws, is getting ready to award this business. Gould & Eberhardt, Newark, N. J., and the Bell Electric Motor Co., Garwood, N. J., are understood to have placed some fair-sized business. The Ludlum Steel Spring Co., Watervliet, N. Y., has issued some inquiries for machine tools and other equipment. The American Locomotive Co., 30 Church street, New York, is inquiring for equipment for a cylinder shop it will erect at Schenectady, N. Y.; it also is inquiring for some heavy forging equipment.

The difficulty in obtaining early deliveries continues to some extent to delay the placing of business, but the trade reports that it is becoming less difficult to take orders for future shipment on equipment to be used for normal manufacturing purposes. Some of the large concerns report they have made some progress of late in the matter of catching up on deliveries, excepting in the case of certain special tools. Others report it still will be several months before they can hope to quote deliveries which will be satisfactory to the general run of consumers. One large concern, for instance, reports that on shapers, cylindrical and surface grinders, milling machines, large lathes and planers, boring mills and automatics it is sold up practically through the year. There have been a few additional price advances, so that prices on machine tools now generally are 35 to 50 per cent higher than they were on March 1, 1915.

The following concerns are expanding or are about to expand their capacity: F. & P. Mfg. Co., formerly of New York, and Jersey City, N. J., which is about to locate in Perth Amboy, N. J.; Lefever Arms Co., Syracuse, N. Y.; Sterling Blower Co., Hartford, Conn.; Driggs-Seabury Ordnance Co., Utica, N. Y.; W. J. Murphy Co., Amesbury, Mass.; Habirshaw Electric Cable Co., Yonkers, N. Y.; Smith & Windham Co., South Windham, Mass.; James F. Burns, Philadelphia; Atlas Ball Mfg. Co., Philadelphia; Rochester Stamping Works, Rochester, N. Y., and the Morse Twist Drill & Machine Co., New Bedford, Mass.

Railroad Buying Interests Dealers

INQUIRY for machinery in the Chicago district continues to come from manufacturers in many lines, and from scattered localities, indicating substantial business conditions. Sales this month prom-

Map of Eastern Section of United States showing Central Location of Massillon

Just the right Location for Service

The Ancient Greeks whose slogan was "AGATHON," which means "highest quality," were largely a commercial people.

"AGATHON" was the solid rock upon which they founded their everlasting reputation.

Part of their success, however, was due to the fact that before they built up a city, they selected the site that would best facilitate their purpose.

Massillon, Ohio, was selected by us as the home of The Central Steel Company because it best facilitates **our** purposes.

It is but a few miles from the Geographical Center of the Iron and Steel business of the United States.

It has most excellent facilities for quick shipment. In fact we can make **overnight shipments** to most northern points.

No matter where YOU are, We are not far away.

"AGATHON" STEEL and "AGATHON" SERVICE

That's what **you** want.

"AGATHON" Chrome Nickel
"AGATHON" Vanadium
"AGATHON" Chrome Vanadium
"AGATHON" Silico-Manganese
"AGATHON" Nickel Steels
"AGATHON" Chrome Steel
"AGATHON" Special Analyses
"AGATHON" High Carbon

Any shape you wish—

Bars, plain or special for cold drawing or machining. **Cold Rolling Strip Stock; Billets; Slabs; Blooms.**

THE CENTRAL STEEL COMPANY

MASSILLON, OHIO

Detroit Office: 326-27-28 Ford Bldg., F. Walter Guibert, District Representative
Cleveland Office: Hickox Bldg. - The Hamill-Hickox Co., District Representative

ise to be considerably less than in March as dealers have not received shipments of machinery to fill the demands of producers eager for equipment. Deliveries from builders have improved in some respects but are still deferred. Railroads continue to inquire for shop equipment. The Indiana Harbor Belt line, La Salle street station, Chicago, is asking for 10 tools, as presented on page 902. The Norfolk Southern railroad, whose requirements were put forth several weeks ago, has closed on its list, the business being distributed about evenly between eastern and western builders. The new lists presented in these columns last week are still open. Second hand machines are not receiving so marked a degree of attention as formerly and buyers are not eager to take what is offered.

Cleveland Market Quiet

THE ACTIVITY in the Cleveland machine tool market is limited to a few tools purchased here and there by manufacturers in various lines. The total business transacted is of good proportions but fails to equal sales of a few weeks ago. There is a consistent inquiry for second hand tools though the number disposed of during the past week has been less than the total sold during the previous week. The Belmont Casket Mfg. Co., Bellaire, O., is in the market for grinding equipment. The Adams Truck Foundry & Machine Co., Findlay, O., will be in the market for equipment for July delivery.

Pittsburgh Interests Active

THE Pittsburgh machine tool market is featured by a heavy, but normal, demand for all lines of equipment. Many industrial concerns are replacing old machines and numerous inquiries are coming out for extension work. Some agents have bought a large number of second hand machines, demand for which is heavy. Numerous orders have been placed recently for portable electrical tools, including grinders and drills. The Carnegie Steel Co. has closed for a large combination punch and shear for its Edgar Thomson works at Bessemer, Pa. The American Sheet & Tin Plate Co. has just bought one 10-ton crane from the Cleveland Crane & Engineering Co., Wickliffe, O., and a 20-ton crane from the Alliance Machine Co., Alliance, O. Generally, crane builders are unable to promise deliveries in less than from four to seven months.

Cincinnati Settling Into Normal Stride

CINCINNATI machine tool builders have fully overcome the handicaps brought about by the strike of machinists which began in the fall of 1915, and today are making deliveries normally. In a large number of cases shipments are being made in a week or 10 days, and it is only at rare intervals that a longer time is being demanded. The strike situation presents no new features. Employers are having no trouble in securing all the help necessary, in fact, more men are applying for work than can be used.

The Pfau Mfg. Co., Cincinnati, recently increased its capital stock from $150,000 to $1,500,000, and will add to its facilities. This company manufactures plumbing supplies. The United States Lathe & Tool Co., Cincinnati, will take over the plant of the Queen City Engineering Co., that city, and begin the manufacture of lathes.

Along the Middle Atlantic Seaboard

NEW YORK.—The Stilwell Chemical Co., 2 Rector street, is having plans drawn by engineers Moses, Pope & Messer, 366 Fifth avenue, for a chemical factory to be erected in Newark, N. J.

NEW YORK.—The Driggs-Seabury Ordnance Co., 50 Church street, has let a contract to the Westinghouse, Church, Kerr & Co., 37 Wall street, for a 4-story, 50 x 300-foot arms manufacturing building, to be erected at Utica, N. Y., at a cost of $90,000.

ROCHESTER, N. Y.—The Rochester Stamping Works has let a contract for the erection of a 1-story, 68 x 100-foot factory addition.

SYRACUSE, N. Y.—The Lefever Arms Co. is having plans drawn by Taber & Baxter, architects, for a 2-story, 44 x 144-foot automobile-gear factory.

SYRACUSE, N. Y.—Russell & King, architects, are drawing plans for an addition to the plant of the Justin Seubert Co., 506 South Clinton street.

SYRACUSE, N. Y.—The Hinman-Boynton Granite Co., 127 Oakwood avenue, is taking bids on the erection of a 1-story, 30 x 50-foot shop building.

SYRACUSE, N. Y.—The Engel Mfg. Co., 239 West Genessee street, has begun excavating for a 2-story, 39 x 60-foot factory building, which will be erected without delay.

WATERVLIET, N. Y.—The Ludlum Steel Spring Co. has let a contract to W. E. Martin & Co., Troy, for the erection of a 1-story 100 x 600-foot plant at Colonie.

YONKERS, N. Y.—The Habirshaw Electric Cable Co. has let a contract to the Caspar Ranger Construction Co., Holyoke, Mass., for the erection of a 3-story, 50 x 170-foot cable factory.

BAYONNE, N. J.—The Texas Oil Co. suffered a loss of $400,000 by fire.

BAYWAY, N. J.—The Waclark Wire Co. will erect a machine shop and storeroom building, 52 x 141 feet; 3-story office building will also be built.

EAST ORANGE, N. J.—The Alvatore Laboratories have been incorporated to manufacture chemicals; $25,000 capital stock; by R. H. Picking, Charles O. Geyer and Gordon Grand, East Orange.

ELIZABETH, N. J.—Plans are now being prepared by Ring, Cleaves & Graham, architects, for a power house and office building for the S. L. Moore & Sons Corporation. Bids will be asked later.

ELIZABETH, N. J.—The Kolperry Corporation has been incorporated to manufacture chemicals; $15,000 capital stock; by John J. Leahey, William J. Montgomery and Frank J. Sylvester, Philadelphia.

ELIZABETH, N. J.—Ring, Cleaves & Graham, architects, are preparing plans for several buildings for the Consumers' Refining Co., of Oklahoma.

HOBOKEN, N. J.—The Jefferson Tungsten Co. has been incorporated to smelt and refine metals; $100,000 capital stock; by Jacob Goldberg, Brooklyn; William P. Coe, Lyndhurst, and Cleon Headley, Tompkinsville, N. Y.

KEYPORT, N. J.—The Aeroplane & Motor Co. has asked for bids for two hangars which will be erected shortly.

MARION, N. J.—The Lovelace Engineering Co. has been incorporated to build engines; $150,000 capital stock; by T. T. Lovelace, W. J. Foster, New York, and Julius C. Halkman, Passaic.

MILLVILLE, N. J.—The city will purchase the Millville Water Co. and the People's Water Co., the proposition having been voted upon at a special election.

NEWARK, N. J.—The General Electric Co. will build a 1-story garage 23 x 63 feet on Boyd street.

NEWARK, N. J.—The Otis Elevator Co. will erect three brick elevators on Park Place to cost $9,000.

NEWARK, N. J.—The Howe - Baumann Balloon Co., 187 Murray street, has let a contract for the erection of a 2-story addition, 25 x 100 feet, to cost $8,000.

NEWARK, N. J.—The United Mfg. Co., of New Jersey has been incorporated to manufacture vending machines; $30,000 capital stock; by R. H. Brown, Elliott Harden, Theodore McMarsh, Newark.

NEWARK, N. J.—The Butterworth-Judson Co. has been incorporated to manufacture refrigerator machinery; $40,000 capital stock; by George Spalt, Albany, N. Y.; R. M. Brias, New York City, and R. S. Brias, Newark.

NEWARK, N. J.—The American Synthetic Dyes Co. has contracted for the erection of two additional buildings at its plant along the Passaic river. One structure will cover ground area of 43 x 322 feet and will be of

Crawford Ore from the Dean-Itasca Mine on the Mesabi Range

The ore is non-bessemer, of good coarse structure. Dean-Itasca mine shipments for 1915 were 486,374 tons, mostly since August 1. For 1916 they will be considerably greater.

A complete analysis of Crawford Ore from Dean-Itasca Mine in natural state and dried at 212° Fahr.

	Dried 212°	Natural
Iron	58.35	50.2451
Phosphorus	.065	.05597
Silica	6.03	5.1924
Manganese	1.00	.8611
Alumina	3.40	2.9277
Lime	.16	.1377
Magnesia	.12	.1033
Sulphur	.031	.0266
Volatile Matter	5.74	4.9427
Moisture	13.89	

Crawford Ore Guarantee for 1916, 51.50 Per Cent Iron, Natural

The output of this mine during 1916, together with our five other mines, gives us an unusually large tonnage.

We are now taking contracts for this ore and will be glad to figure on your requirements for the coming season.

THE TOD-STAMBAUGH COMPANY

Perry-Payne Building

CLEVELAND :: :: :: :: OHIO

steel. The other building will be 38 x 92 feet. The entire cost will be $17,000.

PATERSON, N. J.—The Wells Fargo Co. will build a 1-story freight house adjoining the Erie railroad station.

PATERSON, N. J.—The Public Service Gas Co., Newark, N. J., has let a contract to Post & McCord, 101 Park avenue, New York, for the erection of an addition to the gas plant here to cost $8,000.

PATERSON, N. J.—Plans have been prepared for a new silk mill on Straight street to cost $90,000. The building will be four stories and basement, 65 x 155 feet, with a wing 64 x 117 feet. M. M. Schoonmaker, of Newark, is the engineer in charge.

PAULSBORO, N. J.—The borough of Paulsboro at an election on April 12, approved a bond issue of $10,000, of which the proceeds will be devoted to the erection of a municipal electric-lighting plant.

PERTH AMBOY, N. J.—The F. & P. Mfg. Co., also incorporated as the Folding Partition Co., manufacturer of wood and steel partitions, for use in schools and other structures, has leased, through the efforts of the local board of trade, the building at 294 Market street and will locate its plant there. The company up to the present time has maintained executive offices in New York City, and a plant in Jersey City, N. J. J. T. Fairhurst is head of the concern.

SUMMIT, N. J.—The Union Silk Co., which was recently incorporated with a capital stock of $400,000, will erect a factory building 45 x 90 feet, two stories.

TRENTON, N. J.—The William F. Taubel Co. has contracted with the Harrison-Rea Co. for a plant on Grand street, to cost $80,000.

TRENTON JUNCTION, N. J.—The E. L. Grover Co. has been incorporated with a capital stock of $100,000 and will erect a plant for the manufacture of furniture.

Activities in the Central States

CLINTON, IND.—The Oglesby Furnace-Stove Co. is considering the erection of a factory at Clinton.

EDWARDSVILLE, IND. — The United States Radiator Co. will build an addition to its plant at Edwardsville.

HUNTINGTON, IND. — The Huntington Steel Foundry Co. has been incorporated; $225,000 capital stock; by Edwin B. Ayres, H. E. Roseborough and J. W. Caswell.

INDIANAPOLIS.—The Indianapolis Malleable Iron Co., 546 Holmes street, is building a foundry addition to cost $10,000.

INDIANAPOLIS. — The Partlow-Jenkins Motor Car Co. has been incorporated; $25,000 capital stock; by J. L. Partlow, J. H. Jenkins and D. Partlow.

INDIANAPOLIS.—The Indiana Fuel Saving Co. has been incorporated to manufacture heating apparatus; $25,000 capital stock; by M. G. Greenwald, Charles Halt and Clarence Joseph.

KOKOMO, IND.—The Kokomo Oscillating Fan Co. has been incorporated to manufacture electric fans; $125,000 capital stock; by Thomas F. English, E. B. Seward and Frank H. Smith.

RICHMOND, IND.—The Laurel Motor Car Co. has been incorporated; $60,000 capital stock; by Charles E. Hayes, Harry Gates and James H. Oates.

CHICAGO.—The Imperial Pump & Tool Co. has been incorporated; $20,000 capital stock; by W. O. Hopkins Jr., J. R. Melvin and R. L. Otwell, 8 South Dearborn street.

CHICAGO.—The Crampton Mfg. Co. has been incorporated; $10,000 capital stock; by Frank H. Whitten, 2817 Congress street, John P. Schmidt and C. M. Thom.

CHICAGO.—The Albaugh-Dover Co., 2100 Marshall boulevard, has had plans prepared by Robert M. Hyde, architect, for a machine shop, 90 x 175 feet, costing $30,000, to care for increased business in the manufacture of cream separators and gears.

ROCKFORD, ILL.—The Modern Power Appliance Co. has been incorporated; $5,000 capital stock; by S. G. Smith, H. H. Rogers and William D. Knight.

STERLING, ILL.—The shop of the Twin City Machine Works has been taken over by the Sterling Machine Works and an addition will be built and equipped for automobile and general machine and repair work.

DETROIT.—The Standard Motor Truck Co. is having plans prepared for a 3-story addition, 125 x 150 feet, to cost $100,000.

DETROIT.—The Cadillac Tool Co. has been incorporated to manufacture machinery and tools; $15,000 capital stock; by E. D. Young, T. A. Mead and J. E. Garlene.

DETROIT.—The Shuler Axle Mfg. Co. has been incorporated; $10,000 capital stock; by Frank A. Shuler, John A. Kean and Richard A. Dewey.

DETROIT.—The Detroit Roller Latch Co. has been incorporated to manufacture locks, $40,000 capital stock: by Fred W. Boston, Donald Robertson and Joseph A. Dunnaback.

DETROIT.—The Miller Tool & Mfg. Co. has been incorporated; $15,000 capital stock; by A. L. Miller, R. H. Miller and C. L. Campbell.

EAST LANSING, MICH.—The state board of agriculture will build several agricultural college buildings, including an engineering building, wood working and machine shop, forge and foundry building.

GRAND RAPIDS, MICH. — The Grand Rapids Blow Pipe & Dust Arrestor Co. is having plans prepared by Wernette, Bradfield & Mead, for a 2-story factory, 50 x 220 feet.

KALAMAZOO, MICH.—A. M. Young & Co. have been incorporated to manufacture metal and rubber specialties; $40,000 capital stock; by Arthur M. Young, E. R. Kuhn and John J. Knight.

PONTIAC, MICH.—The Pontiac Gray Iron Co., recently organized, has acquired the foundry department of the Pontiac Foundry & Machinery Co. and will operate it. Harvey C. Wilson is president.

SAGINAW, MICH.—The Erd Motor Car Co. will build a 1-story addition, 50 x 100 feet, to cost $10,000.

SAGINAW, MICH.—The Germain Mfg. Co. will build a 1-story addition, 60 x 130 feet.

ASHLAND, WIS. — The Minneapolis, St. Paul & Sault Ste. Marie railroad (Soo line), with headquarters in Minneapolis, has awarded the general contract for the construction of a new ore dock at Ashland, Wis., to Foley Bros. Construction Co., Minneapolis. The dock will be of concrete and steel construction, and cost in the neighborhood of $1,000,000. The project has previously been noted in *The Iron Trade Review.*

BELOIT, WIS.—The Gardner Machine Co., Beloit, has placed tentative orders for its crane requirements for the machine shop addition with the Pawling & Harnischfeger Co. Details are now being made. Award of contract for erecting the addition to Newton Engineering Co., Milwaukee, has been previously noted.

GLENWOOD CITY, WIS.—E. F. Krueger will build a 2-story machine shop, 50 x 70 feet.

GREEN BAY, WIS.—Articles of incorporation have been filed by the Wattles Rail & Dock Co., Green Bay. The capital stock is $10,000 and the incorporators are H. S. Barkhausen, E. N. and C. R. Murphy.

GREEN BAY, WIS.—It is reported that plans for a car and general repair shop for

For Salesmen Only!

The Iron Trade Review conducts this special department of live leads for hustlers only! None other need apply! Here they are, nine of them.

Better Business means a Bigger Bonus!

Indiana Harbor Belt Railroad Co., La Salle street station, Chicago, G. R. Ingersoll, purchasing agent, New York Central Lines, Cleveland, inquires for the following equipment for its shops:

One 5-foot radial drill; one 36-inch lathe; one 24-inch lathe; one 16-inch lathe; one 1½-inch triple bolt cutter; one 1,500-pound steam hammer; one 16-inch slotter; one 42-inch boring mill; one 24-inch drill and one 16-inch dry grinder.

The American Metallic Packing Co., Walnut and Clark streets, Lexington, Ky., is in the market for a universal milling machine, and also for a second hand Ingersoll or Sullivan 10 x 10 x 10 steam-driven air compressor, a double-head planer complete and 10 or more standard gage flat cars of 80,000 pounds capacity.

The Lenox Sawmill Co., Lenox, Ky., W. S. Whiting, Elizabethtown, Tenn., president, is in the market for used band mill equipment and for 30-ton geared locomotive, a standard locomotive crane, 50-foot boom, two or three tons, and flat cars, standard gage.

The Miner Lumber Co., Coristine building, Montreal, Que., is in the market for wood-working lathes.

The Northern Ontario Power Co., Cobalt, Ont., is in the market for transformers and other electrical equipment.

The Buffalo Mines Co., Kirkland Lake, Ont., is in the market for the supply and installation of motors for operating a mill and compressor at Kirkland Lake.

G. E. Rodderick, Lyndhurst, Ont., is in the market for transformers and considerable other electrical equipment.

James Carr, Alliston, Ont., is in the market for an 18 or 20-inch pony planer.

R. A. Y. Stinchcombe, Wharncliffe road, West London, London, Ont., is in the market for considerable wood-working machinery.

Tons of Pig Iron *in your Wallet —*

The foundryman who has a few *Pig Iron Warrants* in his wallet can forget pig iron troubles; for these Warrants are his *protection.*

Shortages cannot affect HIM because the tons of pig iron represented by his Pig Iron Warrants are held subject to his will—no matter how badly someone else requires them.

Increased Prices cannot affect HIM because he has bought his pig iron at Pig Iron Warrant prices, which, if it is of interest to you, are cheaper than open market prices; and these prices hold, no matter when he wishes delivery.

Pretty good insurance, isn't it?

Let us explain to YOU, *all* the advantages of owning *Pig Iron Warrants.*

American Pig Iron Storage Warrant Co.

68 Williams St. NEW YORK CITY

Say you saw it in THE IRON TRADE REVIEW

the Northwestern railroad prepared several years ago will be used this year and the shops erected at Green Bay. Plans call for a structure 80 x 200 feet of steel and brick. Considerable equipment will be needed.

KENOSHA, WIS.—The Bain Wagon Co. is building a steel and brick addition 75 x 200 feet at a cost of about $60,000. George A. Yule is secretary of the company.

KENOSHA, WIS. — The Greiling Bros. Construction Co., Green Bay, has taken the contract for building a 1,300-foot extension to the breakwater in Kenosha harbor for the Kenosha common council. This extension will be of reinforced concrete and steel construction.

LA CROSSE, WIS. — The Chalmers Motor Co., Detroit, has notified La Crosse contractors that the report that it would erect a branch house assembling and warehouse building at La Crosse is erroneous. It was stated that the Chalmers company contemplated an investment of $150,000 and would erect a 60 x 400-foot building, with a wing, 40 x 60 feet.

MADISON, WIS.—The Trachte Bros.' Sheet Metal Works has been reorganized as the Trachte Bros. Co., with a capital stock of $15,000. The officers are: President, George A. Trachte; vice president, A. F. Trachte; secretary, J. H. Albrecht; treasurer, J. J. McManamy.

MARSHFIELD, WIS.—Articles of incorporation have been filed by the Felker Bros. Mfg. Co., Marshfield. The capital stock is $70,000. The company succeeds to the partnership business conducted under the same name. The concern manufactures corrugated sheet metal culverts, road drags and machinery, tanks, tank heaters and barn equipment. The plant was damaged by fire in December, but at the time a fireproof annex was under construction. A factory of fireproof construction has now been completed and is in operation. The officers of the new corporation are: President, A. G. Felker; vice president, D. L. Miller; secretary, L. H. Felker; treasurer, R. T. Finucane.

MILWAUKEE. — The Wisconsin Foundry Co. is erecting a pattern shop.

MILWAUKEE.—The Pawling & Harnischfeger Co., crane manufacturer, has changed plans for its blacksmith shop to include a cutting-off shop. The building will be 94 x 81 feet and of fireproof construction.

MILWAUKEE.—Bids are being taken by C. L. Lesser, architect, 599 Seventy-first avenue, for the construction of a $25,000 refrigerating building for R. Gumz & Co., packers, Muskego avenue and Canal street.

MILWAUKEE.—The Kero Carburetor Co., capital stock, $15,000, has been incorporated by J. J. McJeskey, W. G. Gehrs and R. N. Van Doren to manufacture carbureting devices for automobiles, trucks and tractors.

MILWAUKEE.—The Industrial Heating & Engineering Co., Milwaukee, is low bidder for furnishing and installing a tandem-compound horizontal steam pump for the hydraulic elevator service in the city hall, and for a piston-type simplex direct-acting boiler feed pump.

MILWAUKEE.—Plans are being prepared by Schuchardt & Judell, architects, 428 Jefferson street, Milwaukee, for a model plant costing $60,000 for the Waukesha Pure Food Co. at Waukesha, Wis. The company was incorporated recently with $200,000 capital stock. C. E. Nelson is secretary.

MILWAUKEE. — The Kerner Incinerator Co., Milwaukee, manufacturing built-in garbage disposal systems for apartments, residences, industrial plants, etc., has increased its capital stock from $100,000 to $200,000. The additional issue will be used to increase the production. Theodore Kerner is president.

MILWAUKEE.—The Mechanical Appliance Co., 123 Stewart street, Milwaukee, manufacturing electric motors, generators, fan ventilating systems, etc., has undertaken extensions. The first addition will be a brick and concrete machine shop, 30 x 135 feet, one story. Louis Allis is president.

MILWAUKEE.—The Fred Miller Brewing Co., Milwaukee, will expend approximately $250,000 in the erection of a 150-room hotel, 3,000-seat theatre and 10-store building on Third street, between Grand avenue and Wells street. Reinforced concrete construction will be used. Plans have been prepared by Wolff & Ewens, architects, Miller building, for a 9-story structure, 100 x 150 feet, and bids are being taken.

MILWAUKEE.—The Milwaukee Shaper & Transmission Appliance Co., recently incorporated with a capital stock of $75,000, has taken over the shaper business of the Lutter & Gies Co., machinery and tools, 258 Lake street, Milwaukee, and will undertake the continuance of the manufacture of that company's product. The new company has taken a lease on the former plant of the Stegeman Motor Car Co., at 1148 Holton street, Milwaukee, and is now installing equipment. Among the contracts for tools already placed are those with the E. L. Essley Machinery Co., Milwaukee and Chicago, which include a grinding machine, cutter, reamer, boring mill and milling machine. The Lutter & Gies Co. will continue to make various types of machine tools and the organization of the new concern indicates no change in its business.

MONTICELLO, WIS.—Wagner & Bauman, Monroe, Wis., have taken the general contract for the erection of a $35,000 cold storage plant and warehouse for Edw. Wittwer & Bros. Co., Monticello. It will be three stories, 50 x 100 feet, with an electric elevator and a 75-ton refrigerating plant.

RACINE, WIS.—The Standard Gas Saver Co., capital stock $10,000; has been incorporated at Racine by M. E. Walker, H. R. Simms and C. V. McAvoy to manufacture automobile engine appliance and devices.

SOUTH MILWAUKEE, WIS.—The New Idea Plaster Board Co., now located at Fond du Lac, Wis., will probably accept offers from the South Milwaukee Advancement Association to remove to that city. If the proposition is accepted, a brick factory, 40 x 200 feet, will be erected. The matter is in charge of George W. Orth, South Milwaukee.

SUPERIOR, WIS. — The International Metal Co., capital stock $100,000; has been organized at Superior by H. J. O'Brienn, J. E. Greenfield and H. E. Greenfield.

WASHBURN, WIS.—The difficulty in getting delivery on structural steel contracts placed last fall is seriously interfering with the plans of the Du Pont Powder Co. in enlarging the plant at Barksdale, near Washburn. Ten new buildings are being erected. Further extensions costing about $250,000, will be delayed. F. T. Beers is general superintendent at Barksdale.

WATERTOWN, WIS.—The Wisconsin Gas & Electric Co., a subsidiary of the Milwaukee Electric Railway & Light Co., will make extensive improvements in the buildings and equipment of the power distributing station at Watertown, Wis., which will serve 150 miles of light and power circuit in southern Wisconsin. A 1,250-kilowatt motor generator set will be installed.

CHILLICOTHE, MO.—H. W. Graham and associates are interested in equipping a plant to manufacture tractors. They are understood to be willing to invest $100,000.

In the South and Around the Gulf

NASHVILLE, TENN.—A survey is being made by the Nashville, Chattanooga & St. Louis railroad, Hunter McDonald, chief engineer, for a 13-mile branch to extend from Doyle, Tenn., into Van Buren county.

ISLAND, KY.—Construction work on the mining plant of the E. M. T. Coal Co. has been resumed at Island. Don Edwards, London, Ky., and H. C. Thompson, Winchester, Ky., are officers of the company.

LOUISVILLE, KY. — James Garnett, attorney general, with offices at Frankfort, and John T. Gathright, of Louisville, are among those interested in a project for construction of a railroad from Campbellsville to Columbia, Ky., which is estimated to cost $450,000.

LOUISVILLE, KY.—Additional equipment is to be added to the plant of the Cement Floor Tile Co., offices in the Franklin building, in connection with an increase of from $5,000 to $20,000 in the capital stock of the company. S. W. Graves is secretary and treasurer.

LOUISVILLE, KY.—A. G. Schwable and W. T. Long are in charge of preparation of the old plant of the Louisville Shovel Co. for occupation by the Falls City Machine Tool Co. This company, affiliated with the Weir Frog Co., Cincinnati, has taken a lease on the plant and will build engine lathes.

LOUISVILLE, KY.—The location of the plant of the Mitchell Rail Anchor Co., associated with the same interests which have a plant in Canada, is projected in Louisville. The company has been incorporated by William Mitchell Sr., W. M. Mitchell Jr., and H. O. Wieland, with $30,000 and has offices at 643 North Twenty-ninth street.

PADUCAH, KY.—D. Harry Jamieson, of the Sherrill-Russell Lumber Co., has prepared plans for a factory for the Paducah Hosiery Mills. It is to include a 31 x 100-foot building, engine and boiler room and will have double the capacity of the present plant.

WINCHESTER, KY. — W. B. Hodgkins, Winchester, is building a machine shop at Irvine, Ky.

WINCHESTER, KY.—The addition of 50 machines to the equipment of the Pioneer Mfg. Co. is projected.

ARDMORE, OKLA. — The installation of additional machinery at the water works plant is being considered.

CHICKASHA, OKLA.—The Chicasha Gas & Electric Co. will build 10 miles of transmission lines to Verden, to carry 3-phase, 6,600-volt current.

OILTON, OKLA.—Bonds for $25,000 have been authorized for the construction of a waterworks plant. Roy McFarland is city clerk.

Pacific Coast and Western Canada

YUBA CITY, CAL.—A bond issue of $500,000 has been asked by the county for building two bridges.

OKANOGAN, WASH.—The county commissioners have awarded a contract for a steel bridge at Riverside to the Illinois Steel Co.

SEATTLE, WASH.—The Pacific Machine Shop & Mfg. Co. has been organized; $2,500 capital stock; by G. E. Steiner and Allan Cunningham.

SEATTLE, WASH.—The Great Northern railroad will spend about $1,120,000 for 30,000 tons of steel rails and 2,500,000 ties this year according to J. M. Gruber, vice president and general manager of the company, who recently visited the coast.

SEATTLE, WASH.—It is reported that a ship yard is to be established in Seattle, which will construct schooners equipped with internal combustion auxiliary engines. It is said the concern will be headed by H. P. Spear, naval architect, of Philadelphia.

LA GRANDE, ORE.—The Oregon-Washington division of the Union Pacific railroad will construct additions to the round house at La Grande at a cost of $40,000. The work will include the addition of 10 stalls.

PORTLAND, ORE.—The Oregon Iron & Steel Co. has announced that its Oswego plant has been opened, after being closed nearly a year.

PORTLAND, ORE.—The Oregon City Iron Works intends shortly to spend about $10,000 in general improvements, involving new equipment, etc.

PORTLAND, ORE.—A contract for furnishing and erecting the steel for the Portland auditorium has been awarded to the Northwestern Steel Co., and the steel will be fabricated at the South Portland plant of the company. About 615 tons will be required.

PORT MANN, B. C.—The Canadian Northern railroad, Winnipeg, Man., has reported that arrangements are being made by M. H. McLeod, manager, for a large terminal to be construction at Port Mann at a cost of approximately $10,000,000. A ferry service will be inaugurated between Vancouver island and the mainland, for which service two car ferries will be constructed capable of carrying a complete train. Two turn tables will be built and machinery will be installed in a machine shop and a 1,000-ton ice house will be erected. The Canadian Northern will also build a shipping dock at Port Arthur, Ont. J. R. Nelson of Port Arthur, is superintendent of the company.

New Business in Eastern Canada

WINNIPEG, MAN.—The Mutual Elevator Co. has been incorporated to build and operate elevators, flour mills, etc.; $500,000 capital stock; by Frederick H. Bole, David L. Bole, Fort Wililam, Ont.; John T. Haig, Alexander Adams and others, Winnipeg, Man.

WINNIPEG, MAN.—The Great Lakes Terminal Elevator Co. has been incorporated to build and operate elevators, warehouses, etc.; $800,000 capital stock; by Robert Siderfin, Ernest B. Eadie, John Ledingham, and others, of Winnipeg.

CHATHAM, ONT.—Considerable improvements will be made to the Canada Flour Mills power plant at Chatham. The improvements will include several 200-horsepower motors to be used for operating the machinery in the plant.

GALT, ONT.—The Perfect Machinery Co. will build a factory on the Manchester survey at Galt to cost $5,000. Construction work will be commenced at once. S. L. Clark is a director of the company.

GRIMSBY, ONT. — The Canadian Steel Specialty Co. has been incorporated to manufacture iron, steel, metals, machinery, tools, implements, etc.; $100,000 capital stock; by Harry G. Hess, Jesse J. Foster, May Wright, and others, all of Grimsby

HAMILTON, ONT.—The Skedden Brush Co,. 130 King street, North, will build an addition to its factory to cost $5,000.

HAMILTON, ONT.—W. Ellis has taken over the Maple Leaf Auto & Garage Supply Co., manufacturers of metal specialties, machinery, tools, etc., and will build a plant on Barton street.

NIAGARA FALLS, ONT.—The Dominion Safe & Vault Co., of Farnham, Que., manufacturer of safes, vaults, etc., is considering establishing a plant at Niagara Falls. H. J. Fuller is president.

SAULT STE. MARIE, ONT.—The city council is making arrangements for the construction of a waterworks system at a cost of $300,000. The clerk is R. G. Campbell.

ST. GEORGE, ONT.—R. Bell & Son Co., whose munitions plant at St. George was recently damaged by fire, will commence at once on the construction of a new plant to cost $5,000.

TORONTO, ONT.—The Alexalite Co., a corporation created under the state laws of New York, has been granted permission to carry on business in Ontario, to manufacture electric light fixtures, equipment, machinery, etc.; $400,000 capital stock; Harry Rohleder, 62 Bismarck avenue, Toronto, has been appointed attorney for the company.

TORONTO, ONT. — Whitfield & Co. are erecting a machine shop at 33 Sherbourne street, Toronto, to cost $12,000.

TORONTO, ONT.—A. R. Clarke & Co., 633 Eastern avenue, will erect a work shop at a cost of $30,000 for the manufacture of leather goods. Bids are being received.

TORONTO, ONT.—The Mecca Specialties Co. has been incorporated to build machinery, motors, boilers, etc.; $4,000 capital stock; by Arthur A. MacDonald, 110 St. Vincent street, David B. Goodman, care Owens, Proudfoot & Macdonald, 32 Adelaide street east, and others, all of Toronto.

TORONTO, ONT.—The M. F. P. Aeroplane Co. has been incorporated to build machinery, tools, appliances, aeroplanes, hydroplanes, etc.; $500,000 capital stock; by Hamilton J. Stuart, 164 Howard Park avenue; William Gilchrist, Gertrude E. Hancock, and others, all of Toronto.

TORONTO, ONT. — The Bournonville Rotary Valve Motor Co. has been incorporated to manufacture mechanical and electrical appliances, machinery, tools, motors, etc.; $500,000 capital stock; by William Gilchrist, James Stewart, Hamilton James Stuart, 164 Howard Park avenue, and others, all of Toronto.

TORONTO, ONT.—The Crowley Mfg. Co. has been incorporated to manufacture all kinds of wood products, furniture, machinery, iron, steel, etc.; $100,000 capital stock; by Thomas W. Pinnell, 567 Concord avenue; Arthur W. Gilmour, 1106 Dovercourt road; James F. Coughlin, and others, all of Toronto.

TORONTO, ONT.—The Hayes Wheel Co. of Canada has been incorporated to build automobiles, motor trucks, machinery, implements, tools, etc.; $200,000 capital stock; by Reginald H. Parmenter, 93 Dunvegan road; Arthur J. Thompson, care Thompson, Tilley & Johnston, 85 Day street; William S. Morlock, and others, all of Toronto.

TORONTO, ONT.—The Universal Transportation Co. has been incorporated to build ships, boats, docks, elevators, etc.; $100,000 capital stock; by Andrew Geo. McHugh, 27 Dundonald avenue, Richmond W. Hart, care Parker & Clarke, Traders Bank building; Herbert C. Leggott, and others, all of Toronto.

WINDSOR, ONT. — The Menard Motor Truck Co. has been incorporated to build motor trucks, automobiles, and to take over the motor and repairing and blacksmith business now carried on at Windsor by Moses L. Menard; $150,000 capital stock; by William N. Gatfield, Sandwich, Ont.; Frederick H. Neal, Moses L. Menard, and others, all of Windsor.

BRYSON, QUE.—The Calumet Zinc & Metals Co. will build a new mill at its plant to replace the one damaged by fire a short time ago.

FASSETT, QUE.—The Standard Chemical, Iron & Lumber Co. will build a new factory at Fassett to replace the one damaged by fire with a loss of $75,000.

HULL, QUE.—The Hull Iron & Steel Co., Montcalm street, will build an addition to its plant to cost about $5,000.

MONTREAL, QUE.—The Lake & River Transportation Co. has been incorporated to build and operate boats, ships, warehouses, etc.; $50,000 capital stock; by William L. Bond, and John B. Johnson, Montreal; George J. Madden, Westmount, Que., and others.

MONTREAL, QUE.—The Dominion Cutlery Co. has been incorporated to manufacture cutlery, iron, steel, metals, machinery, tools, etc.; $100,000 capital stock; by Michael A. Phelan, Westmount, Que.; Ayme Lafontane, Harry L. Cooms, Montreal; Harry A. Ellis, Verdun, Que., and others.

MIDDLETON, N. B.—The Dominion Atlantic railroad, Kentville, N. B., will build an engine house at Middleton. The manager is G. E. Graham.

DARTMOUTH, N. S.—The Williston Steel Foundry Co. is having a plant erected at Dartmouth at a cost of $16,000. Bids for the completion of the plant are being received by C. H. Williston, 504 Robie street, Halifax, N. S.

HALIFAX, N. S.—The Halifax Electric Tramway Co., lower Water street, is having a gas plant constructed in Halifax, and is calling for tenders for the erection of a by-product building, cold storage building and for elevating and conveying machinery in connection with the plant. The engineer in charge is H. R. Barrett.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Lower price to July 1; higher to Jan. 1.)

Bessemer valley	$21.00 to 21.50
Bessemer, Pittsburgh	21.95 to 22.45
Basic, Pittsburgh	19.20 to 19.45
Basic, eastern Pa.	20.50 to 21.00
Basic, Buffalo	18.50 to 19.00
Malleable, Pittsburgh	19.45 to 19.95
Malleable foundry, Chicago	19.50
Malleable foundry, Philadelphia	21.50 to 21.75
Malleable foundry, Buffalo	19.00 to 20.00
No. 1X foundry, Philadelphia	20.75 to 21.25
No. 2 foundry, Pittsburgh	19.45 to 19.95
No. 2, foundry, Cleveland	19.50
No. 2 foundry, Ironton	18.50 to 19.00
No. 2 foundry, Chicago	19.00
No. 2X foundry, Philadelphia	20.25 to 20.75
No. 2X foundry, N. J. tidewater	20.50 to 21.00
No. 2X foundry, Buffalo	19.00 to 19.50
No. 2 plain, Philadelphia	19.50 to 20.00
No. 2 plain, N. J. tidewater	20.00 to 20.50
No. 2 plain, Buffalo	18.75 to 19.00
No. 2 southern, Birmingham	15.00 to 15.50
No. 2 southern, Cincinnati	17.90 to 18.40
No. 2 southern, Chicago	19.50 to 20.00
No. 2 southern, Phila. delivery	20.00 to 20.50
No. 2 southern, Cleveland	19.00 to 19.50
No. 2 southern, New York docks	19.00 to 19.50
No. 2 southern, Boston docks	19.25 to 19.75
No. 2 south. interior, New Eng.	20.00 to 21.00
No. 2 southern, St. Louis	18.40 to 18.90
Virginia No. 2X, furnace	18.50
Virginia 2X, Philadelphia	21.25
Virginia 2X, Jersey City	21.00
Virginia 2X, Boston points	21.75
Gray forge, eastern Pa.	19.00 to 19.50
Gray forge, Pittsburgh	18.95
Gray forge, Birmingham	14.00 to 15.00
Silveries, 8 per cent, furnace	27.00
Silveries, 8 per cent, Chicago	31.50
Low phos. Standard, Phila.	34.00 to 35.00
Low phos. Lebanon, Pa.	30.00 to 32.00
Low phos. Pittsburgh	30.00 to 31.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	19.75 to 22.25
Charcoal, Buffalo	21.00 to 22.00
Charcoal, Birmingham	23.00

IRON ORE

Lake Superior Ores.
(Lower Lake Ports.)

Old range Bessemer, 55 per cent, ton	$4.45
Mesabi Bessemer, 55 per cent, ton	4.20
Old range non-Bess., 51½ per cent, ton	3.70
Mesabi non-Bess., 51½ per cent, ton	3.55

Eastern Ores.
(Per unit delivered eastern Pennsylvania.)

Pt. Henry fur., 60 per cent, unit.	8.5c to 8.9c
Local N. Y. and N. J. ores, unit.	8.5c to 8.75c
Port Henry lump, at mines, ton	$4.00

Foreign Ores.
(Per unit Philadelphia.)
(Prices nominal.)

Foreign Bess., 50 to 65 per cent	8 to 8½
For'n non-Bess., 50 to 65 per cent	8 to 8½

COKE

(At the ovens.)

Connellsville furnace (nom.)	$ 2.00 to 2.50
Connellsville fur., contract	3.00
Connellsville foundry, contract	3.50 to 3.75
Connellsville foundry	4.00 to 4.25
Wise county furnace, contract	3.00 to 3.25
Wise county foundry, contract	3.50 to 3.75
Pocahontas foundry, contract	3.25 to 3.75
Pocahontas furnace, contract	3.00 to 3.25
New River, foundry contract	3.75 to 4.25
New River, furnace contract	3.25 to 3.50

FERRO ALLOYS AND STEEL MAKING METALS

Ferro manganese, 80 per cent, seaboard, prompt	$400 to 450
Ferro manganese, 80 per cent, seaboard, contract	175
Spiegel, 20 per cent, furnace, prompt and 2nd quarter	80.00 to 100.00
Spiegel, 20 per cent, fur., last half	60.00 to 65.00
Ferro-silicon, 50 per cent, Phila.	83.00 to 85.00
Ferro-silicon, 50 per cent, Pbgh.	83.00 to 85.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $30.00; 10 to 11 per cent, $31.00; 11 to 12 per cent, $32.00; 12 to 13 per cent, $33.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-chrome, nominal.

Ferro-vanadium, nominal, Pittsburgh.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

Nickel, nominal.

Ferro-tungsten, $8 to $10 per pound of contained tungsten.

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive for insurance and dockage.

From New York	$0.40
From Pittsburgh	.619
From Youngstown	.619
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

SEMI-FINISHED MATERIAL

Open hearth billets, Phila.	$50.00 to 55.00
Forging billets, Phila.	60.00 to 65.00
Forging billets, Pbgh., nominal.	65.00 to 70.00
Forging billets, Chgo	55.00 to 60.00
Wire rods, Pittsburgh (nom.)	55.00 to 60.00
Bessemer billets, Youngston	45.00 to 50.00
Bessemer billets, Pittsburgh	45.00 to 50.00
Open hearth billets, Pittsburgh	45.00 to 50.00
Open hearth billets, Youngstown	45.00 to 50.00
Bess. sheet bars, Youngstown	45.00 to 50.00
Op. h'th sheet bars, Youngstown	45.00 to 50.00
Bess. sheet bars, Pittsburgh	45.00 to 50.00
Open h'th sh. bars, Pbgh.	45.00 to 50.00
Muck bar, Pittsburgh (nominal)	40.00

SKELP

Grooved steel skelp	2.50c
Sheared steel skelp	2.75c

RAILS AND TRACK MATERIAL

Stand. Bess. rails, Pbgh. & Chg.	1.25c
Stan. op-h'th rails, Pbgh. & Chg.	1.34c
Stand. Bess. rails, Pbgh. & Chg. delivery after May 1, 1917	1.47½c
Stan. op-h'th rails, Pbgh. & Chg. delivery after May 1, 1917	1.56½c
Light rails, 8 to 10 lbs., Pbgh.	2.25c
Light rails, 8 lb., Chgo.	1.85c
Light rails, 12 to 14 lbs., Pbgh.	2.20c
Light rails, 12 lbs., Chgo.	1.80c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.25 to 1.60
Virgnia furnaces to:—	...
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago to.—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Light rails, 16 to 20 lbs., Pbgh.	2.15c
Light rails, 16 to 20 lbs., Chgo.	1.75c
Light rails, 25 to 45 lbs., Pbgh.	2.10c
Light rails, 25 to 45 lbs., Chgo.	1.70c
Relaying rails, standard, Pbgh. and Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect., Pbgh., base	1.50c to 1.75c
Angle bars, st. sections, Chgo.	1.50c to 1.75c
Spikes, railroad, Pbgh.	2.65c to 2.75c
Spikes, railroad, Chgo.	2.75c to 2.90c
Track bolts, Pbgh.	3.25c
Track bolts, Chgo.	3.25c to 3.50c
Tie plates, Chgo.	50.00 to 55.00

SHAPES, PLATES AND BARS

Structural shapes, Pbgh.	2.75c to 3.25c
Structural shapes, Pbgh. (con.)	2.50c to 2.75c
Structural shapes, Philadelphia	2.609c to 3.159c
Structural shapes, Chgo.	2.64c to 3.19c
Structural shapes, New York	2.669c to 3.169c
Tank plates, Chgo.	2.94c to 3.39c
Tank plates, Pbgh. (con.)	2.75c to 3.00c
Tank plates, Pbgh.	3.00c to 4.00c
Tank plates, Philadelphia	2.909c to 3.659c
Tank plates, New York	2.919c to 3.699c
Bars, soft steel, Chgo.	2.64c to 3.19c
Bars, soft steel, Pbgh. (con.)	2.50c to 2.75c
Bars, soft steel, Pbgh.	2.75c to 3.25c
Bars, soft steel, New York	2.669c to 3.169c
Bars, soft steel, Phila.	2.659c to 3.159c
Hoops, carloads, Pbgh.	2.75c
Bands, Pittsburgh	2.50c
Shafting, Pbgh., contr. carloads	10 to 20 off
Bar iron, Chgo	2.35c to 2.50c
Bar iron, Philadelphia	2.559c
Bar iron, New York	2.569c
Bar iron, Cleveland	2.25c
Bar iron, Pittsburgh	2.50c to 2.75c
Hard steel bars, Chgo.	2.50c to 2.75c

SHEETS AND TIN PLATE

No. 28, black Pittsburgh	2.90c to 3.00c
No. 28, black, Chicago	3.09c to 3.19c
No. 28, tin mill, black, Pbgh.	2.90c to 3.00c
No. 28, galvanized, Pbgh.	4.85c to 5.25c
No. 28, galvanized, Chgo.	5.19c
No. 10, blue anl'd, Pbgh.	3.00c to 3.10c
No. 10 blue anl'd, Philadelphia	3.409c to 3.909c
No. 10, blue anl'd, Chgo.	3.19c to 3.29c
Tin plate, 100 lb., coke base	$ 4.75 to 5.00

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickl'd, cold roll. and re-anld.	30 cents
Hot roll'd pickled and anl., tin mill.	25 cents
Full pickled, cold rolled and re-anld.	50 cents
Auto sheets	75 cents
Blue stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxiding	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free fr. mill scale	55 cents
Special open hearth deep stpg. steel, free from mill scale	80 cents
Extra deep special auto body stock.	1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black. Butt.-weld.	Galv.
Steel, ¾ to 3 inches	72	53½
Iron, ¾ to 1½ inches	62	41
	Lap-weld.	
Steel, 2½ to 6 inches	71	52½

BOILER TUBES

Steel, 3½ to 4½ inches, l. c. l.	56
Iron, 3½ to 4½ inches, l. c. l.	44

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$2.40 to 2.50
Plain wire, jobbers', Pittsburgh	2.25 to 2.35
Galvanized wire, jobbers', Pbgh.	2.95 to 3.05
Polished staples, Pbgh.	2.55 to 2.65
Galvanized staples, Pbgh.	3.25 to 3.35
Barb wire, painted, jobbers', Pbgh.	2.55 to 2.65
Barb wire, galv., jobbers', Pbgh.	3.25 to 3.35

IRON AND STEEL PRICES

Corrected up to Tuesday noon

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled thread, 60 and 10, cut threads 60 and 5; larger or longer, 50.

Machine bolts with hot pressed nuts, ⅜ x 4 inches, smaller or shorter, rolled 60, 10 and 5; cut, 60 and 10; larger or longer, 50 and 10.

Cold pressed, semi-finished hexagon nuts, 75 and 10.

Gimlet and cone point lag bolts, 65. Hot pressed square, blank or tapped nuts, $3.25 off list; hot pressed hexagon blank or tapped, $3.25.

Cold pressed square, blank or tapped, $3.50 off; hexagon, blank or tapped, all sizes, $4.25.

RIVETS

Structural rivets, Pbgh	3.25c
Structural rivets, Chgo. delivery	3.30c
Boiler rivets, Pbgh	3.35c
Boiler rivets, Chgo. delivery	3.40c

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	2.50c

STANDARD STEEL CHAIN

Chain, ⅜ inch proof coil	5.00c

COLD ROLLED STRIP STEEL

Base price 6.00c to 6.25c per 100 pounds, hard, coils 1½ inches and wider and by .100 inches and heavier.

Extra for Thickness.

0.100-inch and thicker	Base
0.050 to 0.099	$0.05
0.036 to 0.049	0.20
0.035	0.20
0.031 to 0.034	0.35
0.026 to 0.030	0.45
0.020 to 0.024	0.55
0.025	0.45
0.017 to 0.019	1.35
0.015 to 0.016	1.75
0.013 to 0.014	2.45
0.012	2.80
0.011	3.15
0.010	3.50

Other extras as per card of March 15, 1916.

CAST IRON WATER PIPE

Four-inch, Chicago	$33.50 to 34.00
Six-inch and larger, Chicago	30.50 to 31.00
Six-inch Class B, New York	30.50
Four-inch, Class B, New York	33.50
Four to six-inch, Birmingham	28.00
Six-inch and larger, Birmingham	25.00

Light weight water and gas pipe $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	3.10c
Steel squares, 2-in. & ov., Cleve.	3.75c
Steel rounds, 2-in. & ov., Cleve.	3.75c
Steel bars, under 2 in., Cleveland	3.25c
Steel bars, Philadelphia	3.25c to 4.10c
Steel bars, New York	3.10c
Steel bars, St. Louis	3.15c
Steel bars, Cincinnati	3.20c to 3.75c
Steel bars, St. Paul	3.20c
Steel bars, over 2-inch, Buffalo	3.65c
Steel bars, Buffalo	2.95c
Iron bars, Chicago	3.10c
Iron bars, Cleveland	3.20c
Iron bars, St. Louis	2.75c
Iron bars, Cincinnati	3.20c to 3.75c
Iron bars, Philadelphia	3.00c to 3.25c
Iron bars, New York	3.10c
Shapes, Chgo.	3.10c
Shapes, St. Louis	3.15c
Shapes, St. Paul	3.20c
Shapes, New York	3.10c
Shapes, Cleveland	3.25c
Shapes, Philadelphia	3.25c
Shapes, Buffalo	2.95c
Shapes and plates, Cincinnati	3.20c to 3.50c
Plates, Chgo.	3.50c
Plates, St. Louis	3.55c
Plates, St. Paul	3.60c
Plates, New York	4.00c
Plates, Cleveland	3.65c
Plates, Philadelphia	4.00c
No. 10 blue anl. sheets, Chgo.	3.40c
No. 10 blue anl. sheets, Cleve.	3.50c
No. 10 blue anl. sheets, Buffalo	3.25c
No. 10 blue anl. sheets, St. Louis	3.45c
No. 10 blue anl. sheets, Cinci.	3.50c
No. 10 blue anl. sheets, St. Paul	3.50c
No. 28 black sheets, Chgo.	3.20c
No. 28 black sheets, Cleveland	2.95c
No. 28 black sheets, Cincinnati	3.95c
No. 28 black sheets, St. Louis	3.20c
No. 28 black sheets, St. Paul	3.35c
No. 28 galv. sheets, Chgo.	5.25c to 5.50c
No. 28 galv. sheets, Cleveland	5.25c
No. 28 galv. sheets, Cincinnati	5.65
No. 28 galv. sheets, St. Louis	5.25c to 5.50c

Freight Rates, Coke

Connellsville district, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.85
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

Arch bars and transoms, Chgo.	$19.50 to 20.00
Angle bars, iron, Chicago	18.50 to 19.00
Angle bars, steel, St. Louis	15.00 to 15.50
Arch bars and transoms, St. L.	20.00 to 20.50
Cut forge, Chicago	15.75 to 16.25
Knuckles, coup., Chgo.	16.25 to 16.75
Springs, St. Louis	16.00 to 16.50
Springs, Chgo.	17.25 to 17.50
Knuckles, coup., St. L.	16.00 to 16.50
Locomotive tires, Chicago	18.50 to 19.00
Locomotive tires, St. Louis	18.00 to 18.50
Railroad wrought, No. 1, Chgo.	17.00 to 17.50
Railroad wrought, No. 1, Cleve.	18.00 to 18.50
Railroad wrought, No. 1, St. L.	16.50 to 17.00
Railroad wroug't, No. 1, Cinci.	13.00 to 13.50
Railroad wrought, No. 2, Chgo.	15.75 to 16.25
Railroad wrought, No. 2, St. L.	16.25 to 16.50
Shafting, St. Louis	17.50 to 18.00
Steel car axles, Birmingham	18.50 to 19.00
Steel car axles, St. Louis	26.00 to 26.50
Steel car axles, Chicago	26.00 to 26.50

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—	
New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Minneapolis and St. Paul	32.9 cents
Denver	68.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Boiler plate, cut, No. 1 Chgo.	12.00 to 12.50
Boiler plate, cut, No. 1, St. L.	9.50 to 10.00
Boiler punchings, Chicago	14.00 to 14.50
Busheling, No. 1, Chicago	14.00 to 14.50
Busheling, No. 1, Cleveland	14.50 to 15.00
Busheling, No. 1, Cincinnati	10.75 to 11.25
Busheling, No. 1, St. Louis	13.25 to 13.75
Busheling, No. 2, Chicago	9.75 to 10.25
Bundled sheet, Cincinnati	8.75 to 9.25
Cast, No. 1, Cleveland	13.75 to 14.25
Cast, No. 1, Cincinnati	11.75 to 12.25
Cast, No. 1, St. Louis	14.00 to 14.50
Cast, No. 1, Chicago	13.50 to 14.00
Cast No. 1, Birmingham	11.50 to 12.00
Cast borings, Chicago	7.25 to 7.75
Cast borings, Cleveland	8.75 to 9.00
Cast borings, Cincinnati	7.75 to 8.25
Cast borings, St. Louis	7.00 to 7.50
Machine shop turnings, Chgo.	7.75 to 8.25
Machine shop turnings, Cleve.	8.75 to 9.00
Machine shop turnings, Cinci.	7.25 to 7.75
Machine shop turnings, St. L.	7.75 to 8.25
Malleable agricultural, Chgo.	12.00 to 12.50
Malleable agricultural, St. Louis	12.50 to 13.00
Malleable railroad, Chicago	14.25 to 14.75
Malleable, Cincinnati	8.75 to 9.25
Malleable railroad, St. Louis	13.50 to 14.00
Pipes and flues, Cleve. (nom.)	13.00 to 13.75
Pipes and flues, Chicago	12.50 to 13.00
Pipes and flues, St. Louis	12.50 to 13.00
Stove plate, Chicago	11.50 to 12.00
Stove plate, Cleveland	10.25 to 10.75
Stove plate, Buffalo	11.50 to 12.00
Stove plate, Cincinnati	8.50 to 9.00
Stove plate, St. Louis	10.00 to 10.50
Stove plate, Birmingham	10.00 to 10.50

(Gross tons.)

Busheling, No. 1, Buffalo	15.00 to 15.50
Busheling, No. 1, Pbgh	15.00 to 15.50
Busheling, No. 2, Buffalo	12.00 to 12.50
Bundled sheets, Pittsburgh	15.00 to 15.25
Bundled sheets, Cleveland	12.75 to 13.25
Bundled sheet, Buffalo	13.00 to 13.50
Car wheels (iron), Pittsburgh	16.00
Car wheels (steel), Pittsburgh	18.00 to 18.50
Car wheels, Chicago	14.00 to 14.25
Car wheels, eastern Pa.	17.50 to 18.00
Car wheels, Buffalo	15.25 to 15.75
Car wheels, N. Y.	15.50 to 16.00
Car wheels, St. Louis	13.50 to 14.00
Car wheels, Birmingham	10.50 to 11.00
Cast borings, New York	9.25 to 9.50
Cast borings, eastern Pa.	11.00 to 11.50
Cast borings, Buffalo	9.25 to 9.75
Cast borings, Pittsburgh	11.00 to 11.50
Cast, No. 1, eastern Pa.	18.00 to 18.50
Cast, No. 1, Pittsburgh	16.50 to 17.00
Cast, heavy No. 1, N. J. points	18.00 to 18.25
Forge No. 1, eastern Pa.	15.50 to 16.00
Frogs, switches, guards, Chgo.	16.75 to 17.00
Frogs, switches, guards, St. L.	16.50 to 17.00
Grate bars, Buffalo	12.00 to 12.50
Grate bars, N. J. points	13.50 to 13.75
Heavy axle turnings, Buffalo	12.50 to 13.00
Heavy melting steel, Pbgh	18.00 to 18.25
Heavy melting steel, Buffalo	18.00 to 18.50
Heavy melting steel, Chicago	16.75 to 17.00
Heavy melting steel, Cleveland	17.00 to 17.25
Heavy melting steel, Cincinnati	14.25 to 14.75
Heavy melting steel, eastern Pa.	18.00 to 18.50
Heavy melting steel, New York	15.50 to 15.75
Heavy melting steel, St. Louis	16.50 to 17.00
Heavy melting steel, B'ham	11.50 to 12.00
Iron rails, Chicago	19.00 to 19.50
Iron rails, Buffalo	18.00 to 18.50
Iron rails, Cincinnati	14.50 to 15.00
Iron rails, St. Louis	16.75 to 17.25
Iron rails, Cleveland (nom.)	17.00 to 18.00
Iron axles, Pittsburgh	27.50
Iron axles, Cincinnati	20.75 to 21.25
Iron axles, eastern Pa.	27.00 to 28.00
Iron axles, Chgo.	26.75 to 27.75
Iron axles, St. Louis	23.50 to 24.00
Iron axles, Buffalo	24.00 to 24.50
Low phos. steel, Buffalo	21.00 to 21.50
Low phos. steel, Pbgh	21.50
Low phos. steel, eastern Pa.	22.50 to 23.00
Machine shop turnings, Buffalo	8.50 to 9.00
Mch. shop turnings, New York	9.00 to 9.25
Mch. shop turnings, Pbgh	11.00 to 1.25
Mch shop turnings, eastern Pa.	11.50 to 12.00
Malleable railroad, Cleveland	16.25 to 16.50
Malleable railroad, Buffalo	16.00 to 16.50
Malleable railroad, Pittsburgh	17.00
Malleable railroad, eastern Pa.	14.50 to 15.00
R. R. and mch. cast, No. 1, Bfl.	16.00 to 16.50
R. R. wrought, No. 1, Buffalo	19.00 to 19.50
R. R. wrgt., No., 1 eastern Pa.	23.50 to 24.50
R. R. wrgt., No. 1, New York	21.00 to 22.00
R. R. wrought, No. 1, Pbgh.	19.00 to 19.50
Reroll. rails, 5 ft. & ov., Pbgh.	18.25 to 18.50
Reroll. rails, 5 ft. & ov., Chgo.	18.00 to 18.25
Reroll. rails, 5 ft. & ov., Cleve.	16.25 to 16.75
Reroll. rails, 5 ft. & ov., E. Pa.	19.00 to 20.00
Reroll. rails, 5 ft. & ov., St. L.	18.25 to 18.75
Reroll. rails, 5 ft. & ov., B'ham	14.00 to 14.50
Shafting, New York	19.50 to 20.00
Shafting, eastern Pa.	22.00 to 23.00
Shoveling Steel Chicago	16.25 to 16.50
Shoveling steel, St. Louis	14.50 to 15.00
Steel rails, short, Chicago	18.00 to 18.50
Steel rails, short, Cleveland	18.25 to 18.50
Steel rails, short, St. Louis	16.25 to 16.50
Steel car axles, New York	22.00 to 23.00
Steel car axles, Buffalo	24.00 to 24.50
Steel car axles, Cleveland	25.00 to 25.50
Steel car axles, Pittsburgh	25.00 to 26.00
Steel car axles, eastern Pa.	25.00 to 26.00
Stove plate, N. J. points	13.50 to 13.75
Stove plate, Pittsburgh	12.00 to 12.25
Stove plate, eastern Pa.	13.75 to 14.25
Wrought pipe, New York	13.25 to 13.75
Wrought pipe, eastern Pa.	15.00 to 15.50
Wrought pipe, Buffalo	14.00 to 14.50

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Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
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ALUMINUM.
(Granulated.)
United Smelt'g & Alum. Co., New Haven, Ct.

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ALUMINUM.
(Vanadium.)
American Vanadium Co., Pittsburgh, Pa.

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United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM RODS.
(Sheet.)
United Smelt'g & Alum. Co., New Haven, Ct.

ANGLES, TEES, CHANNELS.
(See Steel, Structural.)

ANNEALING BOXES AND POTS.
Mesta Machine Co., Pittsburgh, Pa.
Pittsburgh Annealing Box Co., Pittsburgh, Pa.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Pittsburgh Valve Foundry & Const. Co., Pittsburgh, Pa.
Swedish Crucible Steel Co., Detroit, Mich.
United Engrg. & Foundry Co., Pittsburgh, Pa.
Zanesville Malleable Iron Co., Zanesville, O.

ARMATURES.
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

ASH BUCKETS.
Lakewood Engrg. Co., Cleveland, O.

AXLES.
American Bridge Co., New York City.
Bethlehem Steel Co., So. Bethlehem, Pa.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.
Otis Steel Co., Cleveland, O.

BABBITT METAL.
Lubricating Metal Co., The, New York City.

BAKERS, WIRE COATING.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BALLS.
(Steel.)
Bethlehem Steel Co., The, So. Bethlehem, Pa.
New Departure Mfg. Co., Bristol, Conn.

BANDS.
(Steel.)
Carnegie Steel Co., Pittsburgh, Pa.

BARGES.
(Steel.)
American Bridge Co., New York City.

BARRELS, TUMBLING.
(Wire Nails.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BARS—ALLOY.
Central Steel Co., The, Massillon, O.

BARS.
(Concrete Reinforcing.)
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Inland Steel Co., Chicago, Ill.
Laclede Steel Co., St. Louis, Mo.
Ryerson, Jos. T., & Son, Chicago, Ill.
Trussed Concrete Steel Co., Detroit, Mich.
Upson Nut Co., Cleveland, O.

BARS.
(Iron and Steel.)
American Bridge Co., New York, N. Y.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Brown-Wales Co., Boston, Mass.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Harvey, Arthur C., Co., Boston, Mass.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago, Ill
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Trussed Concrete Steel Co., Detroit, Mich.
United Steel Co., Canton, O.
Upson Nut Co., Cleveland, O.

BEAMS, CHANNELS AND ANGLES.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

BEARINGS.
(Ball.)
New Departure Mfg. Co., Bristol, Conn.

BEARINGS.
(Vanadium Steel.)
American Vanadium Co., The, Pittsburgh, Pa.

BELLS.
(Marine and Locomotive.)
Van Duzen, E. W, Co., The, Cincinnati, O.

BELT CEMENT AND DRESSING.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Graton & Knight Mfg. Co., Worcester, Mass.
Texas Company, The, New York City.
Williams, I. B., & Sons, Dover, N. H.

BELT LACING.
(Leather.)
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
Williams, I. B., & Sons, Dover, N. H.

BELTING.
(Chain.)
Link-Belt Co., Chicago, Ill.

BELTING—LEATHER.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
Williams, I. B., & Sons, Dover, N. H.

BELTS.
(Conveyor, Rubber.)
Goodyear Tire & Rubber Co., Akron, O.

BENCHES.
(Steel.)
New Britain Mach. Co., New Britain, Conn.

BENCHES AND FRAMES.
(Drawing.)
Turner, Vaughn & Taylor Co., The, Cuyahoga Falls, O.

BENDING AND STRAIGHTENING MACHINES.
Abramsen Engrg. Co., Pittsburgh, Pa.
Bertsch & Co., Cambridge City, Ind.
Birdsboro St'l Fdy. & Mch. Co., Birdsboro, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Covington Machine Co., Covington, Va.
Espen-Lucas Machine Works, Philadelphia, Pa.
Hinman, D. A., & Co., Sandwich, Ill.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Niles-Bement-Pond Co., New York, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Watson-Stillman Co., New York, N. Y.

BENZOL RECOVERY PLANTS.
Hansen, Pavitt & Jensen, New York City.
Koppers, H., Co., Pittsburgh, Pa.

BILLETS.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Central Steel Co., The, Massillon, O.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Otis Steel Co., Cleveland, O.
Republic Iron & Steel Co., Youngstown, O.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Upson Nut Co., Cleveland, O.
Whitaker-Glessner Co., Portsmouth Works, Portsmouth, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sheet & Tube Co., Youngstown.

BLAST FURNACE SKIP CARS.
Lakewood Engrg. Co., Cleveland, O.

BLAST FURNACE VOLUME METERS.
Clark, Chas. J., Chicago, Ill.

BLOCKS.
Bethlehem Steel Co., The, So. Bethlehem, Pa.

BLOOMS.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Hillman, J. H., & Sons, Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Upson Nut Co., Cleveland, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sh't & Tube Co., Youngstown, O.

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